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THE CONSOLIDATED ELECTRIC LIGHT CO.

GEORGE WESTINGHOUSE, Jr., President,

OWNERS OF THE

SAWYER-MAN PATENTS,

GENERAL OFFICE:

32 Nassau Street, New York.

THE GENERAL OFFICES

—— OF THE ——

Consolidated Electric Light Co.,

—— AND OF THE ——

SAWYER-MAN ELECTRIC CO.,

ARE REMOVED TO

510 WEST 23d STREET, NEW YORK.

The Office of HUGH R. GARDEN, Vice-President and General Counsel of the Company, will remain as heretofore at the Mutual Life Building, 32 Nassau Street.

SAWYER-MAN ELECTRIC CO.

HENRY C. DAVIS, President,

COMMERCIAL AGENTS OF

THE CONSOLIDATED ELECTRIC LIGHT CO.,

GENERAL OFFICE AND FACTORY,

510 to 534 WEST 23d STREET, NEW YORK.

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The Van Rysselberghe System in Switzerland.

Dr. Rothen, co-director of the Swiss telegraphs, writes to the *Journal Télégraphique*, of Berne, as follows:

"In Switzerland we have been obliged to give up the Van Rysselberghe system between Geneva and Lausanne, and construct a special telephonic line. We are also compelled to abandon the system between Bale and Zurich; the independent telephonic line is already laid out, and will be constructed as early as the season permits."

Dr. Rothen further writes: "The Rysselberghe system has certain weak points. The apparatus is especially delicate, especially the condensers. A relatively slight atmospheric discharge may destroy them completely. It has therefore been necessary to apply lightning rods which can transmit the atmospheric discharges more easily than the condensers; but then these rods easily become deranged, as a slight atmospheric discharge may put the telegraphic line in communication with the earth, and, in spite of the great sensitiveness of the lightning-rods, the condensers are sometimes destroyed. The Rysselberghe system affects the telegraphic service in an annoying manner. At the outset it is necessary to increase the batteries of the telegraphic stations considerably; but a worse point is that the telegraphic service is delayed by the increased duration of the variable state of the currents. The Morse service generally does not suffer, but the transmission on the Hughes system is often deranged, and the service of the rapid apparatus, such as the Wheatstone, is probably impossible.

"From a telephonic point of view, the transmissions are very faint, at least with ordinary apparatus, and the silence of the telegraphic signals is, so to speak, obtained only in theory.

"The costs of the installation of the system are not so trifling as it is sometimes believed. Its application on the telegraphic line from Geneva to Lausanne cost about 15,000 francs."

The Newport Beacon Light.

For many years past the Old Colony Steamboat Company have maintained, at a large expense, an oil lantern on the summit of the beacon on the southern point of Goat Island, Newport. In very bad weather it has been impossible for the man charged with lighting this lamp to effect a landing at this point, and, therefore, when the light was most needed it was frequently absent.

Early in this year the company asked and obtained permission from the Bureau of Ordnance, Navy Department, Washington, to connect this beacon by electric cables with the incandescent illuminating plant of the torpedo station.

Upon the summit of the beacon there has been placed a duplex socket carrying a thirty-two candle-power lamp, supplied by the Sawyer-Man Company. As our readers well know, this socket is so arranged that but one lamp of the pair burns at a time; the second lamp switching in automatically on the failure of the first.

The beacon stands about 500 feet at the end of the southern point of Goat Island. This part of the circuit is buried. A double conductor cable armored with sixteen galvanized iron wires, No. 6 A. W. G., is used. This cable is 1,200 feet in length and is carried to the mainland along the crest of the spit of sand in which it is buried to the depth of about two feet. The end of the submarine cable is connected with the distributing point of the torpedo station electric lighting plant, by two single conductor wires supplied with extra tape insulation, each 1,100 feet in length. As a protection against mechanical injury, these wires are placed underground in grooved chestnut molding. At the junction of the submarine and underground wires is a suitable connecting box furnished with lightning arresters, plugs, etc., for purposes of testing.

The whole installation was supplied by the Okonite Company, material and work being subjected to the supervision and inspection of the officer commanding the torpedo station, Commander C. F. Goodrich, U. S. Navy, the Old Colony Steamboat Company paying all the bills and assuming all responsibility in the matter.

The beacon was first lighted for experiment on Friday night of last week. This preliminary test proving satisfactory, the operation of the light was definitely installed on Saturday night. The details of the installation are so complete and the insulation of wires so high, that failure of the lamp, at least for a long time to come, may be considered as a remote contingency.

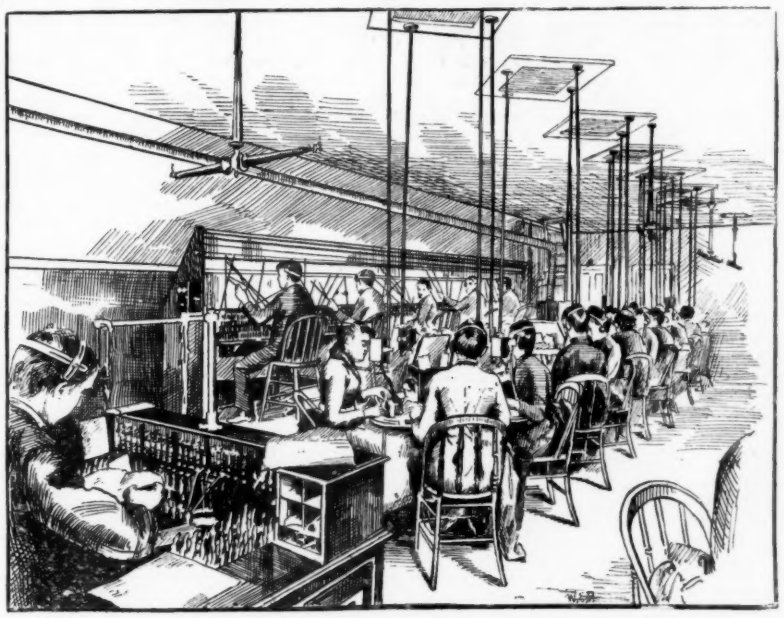
The captains of the Fall River boats and the officers of the company, express themselves as greatly pleased with the new order of things. The former lamp was difficult to distinguish; the present lamp is a marked feature on entering the harbor at night.

The cost of the installation will be covered in a comparatively short time through saving to the company the yearly expense involved in hiring a man to light the lamp at all seasons, in renting a boat for the purpose, in supplying oil and in replacing lamps broken unavoidably in bad weather.

The Work of a Typical Telephone Exchange.

A telephone exchange is always interesting. The privileged visitor is always well entertained. He finds different arrangements and slightly different methods prevailing in the various exchanges, but he will always find the sweet tempered and pleasant voiced young ladies answering the calls promptly and doing all in their power to satisfy the hurried and oftentimes impatient subscriber. The discipline in telephone exchanges is always of the best. The nature of the business demands it, and the subscriber, on visiting the exchange, with the fact of his own experience before him and the noise he is easily able to make with only one telephone, is always astonished at the absence of noise and confusion that greets him when he is privileged to visit "central."

The illustration presented on this page is that of the Spring street exchange of the Metropolitan Telephone and Telegraph Company of New York City. In this exchange



VIEW OF A NEW YORK TELEPHONE EXCHANGE.

the switchboard of J. P. Davis is used. The answering operators and annunciators are on the right; the chair of the first operator can be seen. The middle row of trunk tables is arranged in groups of four, each operator handling about ten trunk wires. The switch-boys, whose only duty is to make the connections, and afterwards to disconnect, are to be seen on the left. They are silent, and it is well. There is nothing quite so disturbing to the hurried subscriber as to be answered by a male voice; therefore, all exchanges, whenever possible, have placed the gentle voiced young ladies in position to answer calls, and complaints against operators have been greatly lessened.

The exchange shown is one of the busiest in New York. A REVIEWITE called on General Superintendent W. A. Vail recently, and secured the data relating to the business of the day before. There had been sent out from the Spring street exchange that day 4,554 trunk connections, and had been received 3,958. The local connections; that is, those beginning and ending the exchange, amounted to only 1,976. There are 1,024 subscribers in this exchange and forty-eight employés, including operators, managers and linemen. One hundred and forty trunk wires, connecting with other exchanges, come into the Spring street exchange.

When a call is received by the operator on the right it is recorded on a slip like this: "489 wants 546 John." This slip is passed to the proper operator at the trunk boards in the centre, who immediately, by means of the cam lever, loops into the telephone circuit of the headphone of the boy at the switching board, and he, on being told, places the plugs in these numbers and rings the subscriber called for. This is done in less time than it takes to tell it.

The manager, with his switchboard, is shown at the head of the room.

In no department of telephone work has there been more marked improvement than in central office facilities, and in this direction the telephone company of this city has spared neither expense nor talent, and when its great multiple switchboard and metallic systems are completed, it will be as it should be, the most perfect as well as the most expensive telephone exchange system in the world.

The Smallest Vessel Lighted by Electricity.

The torpedo station launch, "Wave," was placed in commission last week at Newport, having been thoroughly overhauled and installed with an electric lighting plant. This is undoubtedly the smallest vessel afloat lighted by electricity. As she plied between the city and the station she presented a very attractive appearance, both cabins and the engine room being brilliantly lighted and a light on the pilot house, together with electric side lights, iliuminating the hull. The light is produced by a Tuibo electric gererator furnished by Clark, Chapman, Parsons & Co., of Gateshead-on-Tyne, England, running fifteen Thomson-Houston sixteen candle power incandescent lamps. This generator is the only one of its kind in this country and is exceedingly novel in design. It is described in the Newport *Daily News* as follows:

The motor and dynamo are mounted on a common shaft and, of course, revolve at a common rate of speed. The motor consists of a series of turbines, that is, of fixed and moving rings of blades, the former of which guide or deflect the steam on to the latter in such a direction as to effect their rotation. To avoid the waste that would occur if the steam was allowed to expend its energy in discharge, several turbines are combined together and so arranged that the exhaust of the first works the second, that of the second working the third, and so on, after the manner of a quadruple expansion engine. By gradually enlarging the blades and increasing the pitch it is possible to extract the greater part of the energy and to discharge it with moderate velocity. An ingeniously contrived centrifugal pump attached to the shaft supplies a constant flow of oil to all the bearings and an electrically controlled governor, capable of adjustment to any desired electro-motive force, ensures a perfectly steady light. This generator weighs but three hundred and thirty pounds, yet it has a capacity of thirty sixteen candle power incandescent lamps.

Its extreme lightness and compactness, combined with direct coupling, gives it advantage over all others for ship lighting, provided it is, as is claimed, economical in the use of steam. To determine this and other questions, a series of experiments will be conducted at the torpedo station, the result of which will be awaited with much interest.

The Continuous Current versus The Alternating Current.

BY GEO. H. BLISS, BEFORE THE CHICAGO ELECTRIC CLUB.

I shall be compelled to confine my attention largely to the commercial side of the question, but as Mr. Edison has often said, "Any invention which is not commercial is N. G.," and as we claim the constant current system is commercial, in that it now returns a profit to the investor; where ordinarily good judgment, practical skill and management is employed something may still be found worthy of consideration from my point of outlook. Considerable has been said in the progress of this discussion upon the subject of electrical engineering ability.

In the electric field I know of no undertaking more brilliant in conception, audacious in execution and successful in operation than the First District station of the Edison Illuminating Company in New York City.

At the time it was planned electric incandescent lighting was generally believed to be impracticable.

The lamp, dynamo, underground conductors, meters, regulating apparatus and various appliances had to be perfected, and, to a large extent, devised.

This constant current, low tension system was installed in the financial center of this country in the teeth of the most powerful gas companies in the land, and in a district where the buildings are largely vacated at night, so that the amount of light required is relatively small.

The light was to be sold by meter, and had to win its way not only in competition with gas but with other forms of electric lighting.

Croakers prophesied that the system would not work; when it did work, that it would not endure, and when it endured, that it would never pay.

It will be five years in next September since current was first turned on the system, and with the exception of two hours, on a single occasion when the safety catches in the feeders burned out from insufficient capacity, there has not been a single instant, night or day, when the current supply has failed.

When some of the alternating currents stations, with their dynamos and single pairs of conductors have made a record equal to this, the capital invested may begin to feel secure, for constancy is a prime factor in electric lighting.

The means employed for regulating the light have been found reliable and satisfactory.

Not the least interesting feature in connection with the operation of this system, to me, is the means employed to locate faults in the underground conductors by tests at the station while current is flowing over them.

It is not unusual to locate from the station within a few feet of the spot where the fault exists.

Although the Edison tubes in use are the first manufactured, they have proved reliable in the main, and are in good condition.

The meters give correct measurement of the current used, and customers pay their bills.

11,000 sixteen-candle lamps are daily supplied from this station.

This success has resulted in the capital being furnished, largely by the original investors, for the four Edison stations now being installed in New York, with an aggregate capacity of 150,000 lamps.

A gentleman of large electrical and business experience, who recently rigidly examined the books of the Edison First District in New York, with a view of a considerable investment of his own money in the Chicago Edison station, which investment he decided to make, assures me that the station is earning eight per cent. upon its capitalization.

It is interesting to note that the Chicago Edison station, which is now being erected here, will have capacity for 50,000 lights instead of 30,000, as originally intended.

The money furnished for this work comes largely from parties who have been interested in the Edison business in the west for several years past.

The large Edison stations in Boston, Philadelphia and elsewhere, ought to convince any fair-minded man that profit is to be realized in the use of a constant current low tension system.

Capitalists as a class do not transact business on a sentimental basis, and if our alternating friends shall be so fortunate as to scoop the present investors in the constant current system by a competitive system, we need not waste much time in sympathy and lamentation.

We as members of the dear public may get some benefit in the price at which light can be had.

My only suggestion is that our alternating friends hurry up, for operations in the Edison constant current system are in early contemplation which, for the amount of capital involved, rivals the Chicago Gas Trust Syndicate.

An established electric light industry is a hard thing to unseat, and time, experience, and readiness for operations, are valuable elements towards early success.

I consider it conclusively demonstrated beyond cavil or dispute, that capital invested in Edison constant current installations in large areas of compactly built cities, under the most adverse circumstances in the present state of the art, will form a profitable investment.

As the opinion prevails to a considerable extent that the alternating system presents peculiar advantages for small towns or cities with a scattered population, I will cite only one instance in favor of the continuous current, three wire Edison system.

The city of Laramie, W. T., has a population of 6,000 people, and fairly represents the average place of that size.

There is now in operation at that place an Edison station supplying 4,000 lamps.

A personal friend who invested some money in this station largely upon my advice, informs me that it is paying him ten per cent.

This earning has been made until recently, exclusively from the sale of current for incandescent lighting, the station being a little over two years old.

Early in the present year the sale of current for use in supplying power was commenced, and the prospect is that within the present year the income from this source will equal, if not exceed, the income from light.

I will instance one or two customers to whom current for power is sold.

The Laramie Milling Company is supplied with current for two 25 horse-power Sprague motors. It is a modern roller mill, with the capacity of 100 barrels of flour per day.

There is no boiler or engine about the institution. For reasons connected with the manufacture, it was decided to use two 25 horse-power motors instead of one 50 horse-power.

The manager of the mill says the power is satisfactory in every way, and as constant as the best regulated automatic engine.

He enumerates the following advantages:

Ease in placing the power where wanted, and thus avoiding long lines of shafting, or more objectionable belts.

Economy of room for power plant.

Saving of first cost of power plant, interest and taxes. Thirty per cent. saving in insurance rates.

An economy and increased reliability over steam power for his use.

It may be unfair to the Edison interest to give away to our alternating current friends the price which is paid for the power, but in this case I am going to risk it.

The average load on these two motors is 28,000 watts, and the price paid is $292 per month of 26 days, 10 hours per day.

The Laramie Edison Company also supplies current to a rolling mill for a 20 horse-power Sprague motor.

Power is communicated from the motor to 120 feet of three-inch shafting. This shaft drives four spike machines, two bolt headers, two nut pressers, and a large number of threading and tapping machines, including some emery heads.

The average load is 11.250 watts for 20 hours a day, which is paid for at the rate of 50 cents per hour.

The mill was formerly run by steam power at a larger cost, and in not nearly as satisfactory a manner.

These mills are supplied with current directly from the regular feeders of the Edison station.

In addition, the Laramie Company is selling current for a number of smaller motors.

Already the income of the company is at the rate of over $6,000 a year from the sale of power.

These statements are made upon the authority of Mr. R. M. Jones, the manager of the Laramie Edison Company.

This illustration furnishes conclusive proof that the Edison constant current, three wire 220 volt system in cities of the smaller class can be made profitable.

It is appropriate at this point to give the question of the sale of current for power from electric generating stations additional consideration.

This branch of the business has already acquired magnitude, and is destined to grow into gigantic proportions.

The maximum lighting load of a station is seldom carried for more than from two to three hours in the twenty-four.

During the balance of the day there is a large surplus capacity in boilers, engines, dynamos, and conductors, which must remain idle unless employed otherwise than in supplying current for lights.

The sale of current for power comes in to fill this gap, as it is needed largely at a time when light is not required.

The sale of a single electrical horse power of energy for ten hours is equivalent to the sale of forty-eight sixteen candle lamps for three hours, which would be a large average burning.

It is a fact where the Edison stations are run day and night that the current sold for power exceeds the current sold for day lighting, and in many cases it is rapidly growing towards an equality with the entire sale of current for light, night and day.

I will give one example of what an Edison station can do in a city of the medium class.

The Detroit Edison station is now supplying current for about 9,000 lamps, and they are behind their orders for installations to the extent of several hundred more.

THE IMPROVED SELLON STORAGE BATTERIES.

In regard to the sale of current for power it is supplied as follows:

Printers, 6; newspapers, 1; opticians, 1; laundry, 1; chemical works, 2; wire works, 1; shoe manufacturers, 3; bookbinders, 1; machine shops, 2; telephone companies, 1; knitting works, 1; hydraulic elevators, 3; elevators, 3; sewing machine shops, 5; dentists, 6; jewelers, 3; ice cream dealers, 1; sporting goods, 1; ash elevators, 1; storage boilers, 1; also quite a large number of small motors for single fans, sewing machines, etc.

The party taking the lagest amount is the Detroit *Tribune*, thirty horse power; and the knitting works take fifteen. The present aggregate sale amounts to 162½ horse power which, at $100 per year, makes an income of $16,250, which is not to be despised.

In view of such a source of revenue which is available to the constant current system, I cannot avoid the conviction that the capitalist should use extreme caution in investing his money in alternating systems which so far are only able to promise a successful motor for use in connection with their current in the dim hereafter.

A great hullabaloo has been made in this discussion about the cost of copper in connection with the constant current system.

In the territory which it is the custom to attempt to cover with the Edison system the cost of copper seldom equals twenty per cent. of the entire cost of the installation.

As the constant current has unrivalled capacity for producing revenue within the territory covered, it certainly ought to be greatly preferred even if there was a large margin of cost in copper against it.

I will give one or two examples of what the actual cost is for copper in a couple of Edison stations now in process of installation.

For one installation which provides 100 street lamps, scattered over an area of 1½ miles square and 500 lights for stores, residences and churches in a mile square, the entire cost of copper, at 20 cents per pound, is $3,000, or $5 per lamp.

For another installation, where 100 street lamps are scattered in one area, two miles square and 300 inside lights in an area about a mile square, the entire cost of copper, at 20 cents a pound, is $3,102, or $5.44 per lamp.

I have not as yet seen or heard a satisfactory answer to Mr. Leonard's statement of the comparative cost of the conductors of the two systems, when converters at at $3 per lamp are taken into consideration, for average practical installations, at reasonable distances.

As Mr. Leonard has already stated, the load diagrams of the Edison stations show that the maximum number of lights burning at one time is only forty per cent. of the number of lamps actually installed.

I want to emphasize the point that conducting capacity in the feeders and mains is only supplied for the highest number of lamps carried at one time, and yet in any one building, all the lights may be in service at once. Therefore conductors must be supplied for the full lamp capacity.

On a general Edison installation with conductors, for say 1,000 lights, 2,250 lamps may be installed in the buildings.

The investment for converters from this standpoint, is enormous.

Parties engaging in the electric lighting business presumably do so with a view to doing the great bulk of the lighting in the territory covered.

I do not suppose over ten per cent. of the gas jets in Chicago, are ever lighted at one time.

The party undertaking to supply converter capacity for a number of lamps equivalent to the gas jets in Chicago, will have an investment on his hands sufficient to appal any one who is not swayed by an imaginary advantage.

Criticism has been made upon the constant current station on account of the amount of apparatus it contains.

For my own part I greatly prefer apparatus located at the central point, in the hands of competent employés to keep it in order, to scattering a lot of converters all over creation where they will necessarily make a great deal of trouble.

Any one who has had experience with electric appliances in which isulated wire is used and through which powerful currents pass, whether it be telegraphic, fire alarm, electric light or any other form of apparatus, know that it is liable to frequent troubles and when converters are placed on poles or the exterior of houses, or even in the interior of houses, where they necessarily must often go in damp places, the claim that they will not need frequent care and attention is certainly all bosh.

Moreover, in many of the latest Edison stations, feeder equalizers are dispensed with altogether, so that switches, current and pressure indicators constitute the sum total of the special appliances.

It is just as easy to run constant current generators with a seperate exciter for the fields, as is the case in the alternating system, so I fail to see any special force to that argument, except that it is not usually done.

The advantages, to my mind, of being able to multiple-arc dynamos and of having a number of feeders supplying a common system of distributing main conductors, is very great.

The auxiliary conductors used in connection with the alternating system bring up the cost for copper in a measure, and add to the complication of their circuits.

The objection which has been urged to the operation of two classes of apparatus in the same station will hardly hold so long as our alternating friends find it necessary to use constant current dynamos to supply the arc lights operated from their stations.

I am still unable to see any special advantage for the 50 volt lamp which is claimed to be specially adapted for alternating work.

It certainly increases the size of the inside wiring as compared to the 110 volt lamps, and places that part of the alternating installations in antagonism to the principle which is claimed to be so advantageous in the exterior conductors.

No doubt lamps of the same voltage from different manufactures will vary considerably in results.

A recently published article in regard to the incandescent lamps, written by John W. Howe, who is a high authority, says that lamp renewals should not exceed 15 per cent. of the operating expense of a central station plant.

I am not aware that the cost of Edison 110 to 120 volt lamps exceeds this figure, nor that the Edison Company is unwilling to guarantee an equal number of lamps to the horse-power and an equal life with any other lamp in the market.

An admirer of our friend Mr. Cutter, says he always likes to hear him talk.

I confess that during the progress of this discussion Mr. Cutter has helped me to understand how it is that the Thomson-Houston Company secures such a large slice of the electric business, for his talk is very plausible.

As against his theory that the eye judges the light at the instant of maximum incandescence when the impulses are in the lamp, and hence that the alternating current may be more economical than the constant current in the incandescent lamp, I want to suggest that the successive impacts of the alternating current must have a tendency to impair the structure of the carbon, for, in my experience, rapid changes in current have been a fruitful cause of brevity of lamp life.

I must also take exception to Mr. Cutter's view that a conduit system with small ducts through which conductors can be hauled from time to time between man-holes located at convenient distances, is the most desirable.

The experience with this system in Chicago certainly does not bear out this conclusion.

If with a high tension alternating system

it is going to be necessary to have new conductors hauled in every few days because those in use burn out, I can understand part of the necessity for such a construction.

How such a conduit system is adapted to an electric distribution from which taps must be taken every few feet in order to enter buildings, is not clear to me.

Considering the expense, I still believe the Edison system of underground conductors, all things considered, the best which has yet been devised for incandescent work.

It is easy to increase the thickness of the iron casing, if the soil makes it advisable to do more than guard against mechanical injuries.

I am aware that the Chicago troubles with the high tension underground conductors have been greatly lessened recently by a heavy increase of the insulation employed.

This is a fact which stares the alternating current in the face.

Large first cost for insulation and constant care and expense to maintain apparatus to prevent an undue percentage of waste in the current supply.

The feeders in an Edison three wire system are usually figured at ten per cent. loss, the distributing mains at two per cent., and the inside wiring at the same, or a total of fourteen per cent. under conditions of full load.

As has been stated, the percentage of loss of current in the conductors is proportional to the load, so that the average loss is much smaller, say five or six per cent. With the alternating current the opposite is exactly the case, for the converter has its highest efficiency with the maximum load, but runs down materially as the load decreases.

The alternating current system being practically confined to the sale of light, for the present, and the maximum capacity of the converters being seldom called into use in a general lighting system, the advantage seems to be against it for economic use for distances which the constant current system attempts to supply.

I have always been strongly in favor of selling current for the incandescent light by meter measurement and thereby profiting from the long experience of the venders of artificial gas.

I am well aware that there are Edison central stations selling light by the contract system which earn twenty per cent. on their capitalization, but such cases are exceptional, and it is my conviction in the long run that that method will not be found satisfactory either to the customer or the companies.

There are now thousands of Edison meters in successful use, and until the alternating companies shall perfect a meter and put it into extended use, the lack of this will continue to be a great objection to that system.

Allusion has been made several times to the excessive cost of the ground upon which the Edison stations are located, and I still want to say a few words on this branch of the subject.

It has been stated to the club that in Boston, capital has been offered to the Edison Company to erect a building sufficiently large to accomodate the station, and provide enough additional room for rent, to pay a handsome profit on the investment in the ground and building.

Our president has suggested that, as other large corporations frequently provide their own accomodations in this way, electric light organizations may do so also.

The Chicago Edison Company cannot be accused of any effort in this direction, but is evidently inclined to meet its fate strictly in the line of the sale of electric energy.

I desire to repeat the statement heretofore made by myself, that when a station is centrally located, the sale of exhaust steam for heating purposes to surrounding buildings should become a large source of revenue.

In combination with the Johnson heat regulating apparatus especially favorable results can be obtained.

The Chicago Edison station already has applications for steam heat, and I have no doubt this source of revenue is to become an important factor in electric lighting stations.

When a station is located in the suburbs, the exhaust steam is necessarily thrown away.

It should be distinctly understood that I am no alarmist in regard to danger from electric lighting currents.

I believe there is no electric lighting in use which begins to compare in danger to property and life with gas.

Still the fact that it is thought advisable by some to ground the secondary circuits, and by others to ground a metallic shield between the primary and secondary coils in the converters for the protection of customers of the alternating system, is in itself a confession of danger. Either method appears to me to make a series of first-class lightning arrestors out of the converters well calculated to protect the community at large at the expense of the pocket books of the stockholders in the alternating companies.

In Edison's early work on the incandescent light he frequently expressed the determination to devise a system which by no possibility could injure any man, woman, or child. That was a noble ambition, and I for one shall be sorry to see, for economic reasons, his system for general use, so modified that this element of safety cannot be claimed for it.

A gentleman connected with a life insurance company recently stated to me that his company had decided to make all employés engaged in the dynamo room and on line work of the alternating systems special risks, the same as arc light employés.

This is not the case with the employés of the low tension constant current system.

The public has a right to demand the highest standard of safety in electric lighting and there have been few more commendable things done in this city than the establishment of a rigid inspection of electric light plants, vexatious as Brother Haskins sometimes makes himself.

The tendency of legislation and the courts is to hold corporations to a strict accountability for losses and injuries arising from carelessness of employés in management and construction.

It will be absolutely necessary in using high tension alternating or constant currents, to maintain a high standard of insulation and efficiency, to avoid the assessment of heavy damage in case of accidents.

In this respect, the low tension constant current system has a great advantage over high tension alternating currents. Even where a high tension constant current is transmitted a long distance and converted by a motor generator, there is less risk, for in case of accident at the station, it would be quickly discovered, and remedied by the attendants, while with the alternating current it is possible to bring a death current within reach of the individual users of the light, where the danger might not be discovered until a fatality had occurred.

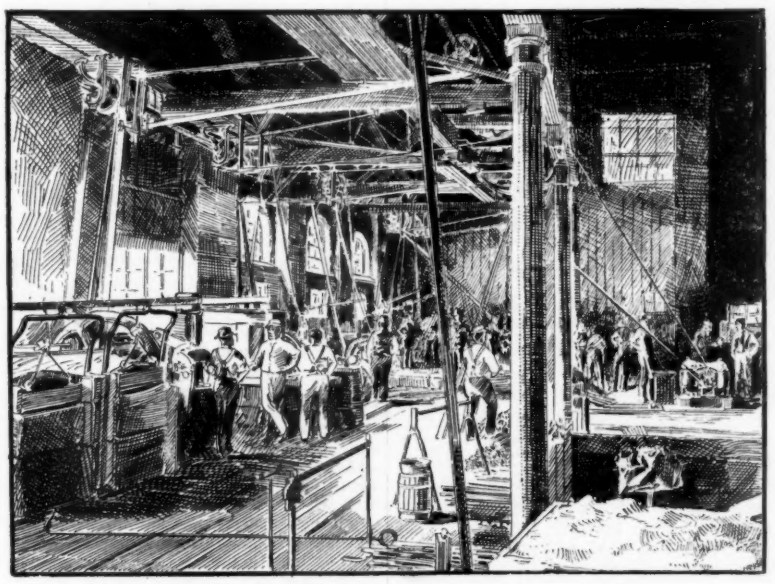
The Electric Motor in a Rolling Mill.

The Laramie, W. T., Rolling Mills has adopted the Sprague Motor and has it in use daily. In our illustration is shown a 20 horse-power motor which runs about 120 feet, of 3 inch shafting, which contains a number of heavy pulleys.

This shaft drives four spike machines, two bolt headers, two nut presses and a large quantity of threading and tapping machinery, including some emery heads. It takes less than 20 horse-power to drive this shaft, and it delivers a uniform speed to all machines.

Previous to placing this motor, the power was transmitted nearly 300 feet by belts and shafting, and it required nearly 50 horse-power to do the same work which is now done with less than 20.

It is also known at the rolling mill that the men are doing one-half more work now than by the old belt system, owing to the fact that much of the time, speed was so slow, caused by low steam, that machines had to be shut down.



THE SPRAGUE MOTOR IN THE LARAMIE ROLLING MILL.

Improvement in Storage Batteries.

In these, its youthful days, the storage battery has received a very meritorious development in the construction set forth in the patent of May 22, 1888, to the Electrical Accumulator Company, as the assignee of J. S. Sellon, of England. The purpose of the invention is to permit the removal of any one element of a series without disturbing the remaining elements or interrupting the continuity of the circuit in which the battery is located. For this purpose the inventor constructs a double plate of such shape as to permit placing one of its ends into one cell, and the other end into an adjoining cell, the two ends being respectively positive and negative. A second plate of the same character is put into the cells in a reversed position to that of the first-named plate, and other plates are added in alternate manner, each couple being independent both mechanically and electrically; so that should any element of a cell become impaired in any way, it may be removed and substituted without disturbing the remaining elements or interrupting the operation of the battery, thus permitting an immediate removal of imperfect or damaged plates and their replacement. The foregoing construction also permits the convenient variation of the capacity of a cell, or the charging of the plates in an independent tank or cell, should such be desirable. The cut on page 2 illustrates the invention very clearly.

The Wires of New York—What a Coroner's Jury is Finding Out.

Coroner Levy and his jury had another inning with the electric light wires and poles, Tuesday of last week. The proceedings were held in the City Court Room of the City Hall. General Newton, Commissioner of Public Works; Commissioner Daniel L. Gibbens, of the Board of Electrical Control, and Mayor Hewitt furnished the testimony. The two former found it all plain sailing. Mayor Hewitt and Coroner Levy indulged in some sparring, but it was brief. The little Coroner was floored in no time, in the opinion of the N. Y. *Tribune*, and didn't attempt to renew the combat, which, indeed, was not of the Coroner's seeking. Mayor Hewitt denied that he had intended to snub anybody and then made a clean breast of his reasons for not ordering the Commissioner of Public Works to remove the electric-light poles and wires. It seemed to satisfy the jurymen, for they had no questions to ask the Mayor.

General Newton said that he had received a letter from the Mayor asking him if he had money available for the purpose of removing electric-light poles and wires. He replied that he had none, as no appropriation had been made for such purposes, and he didn't feel justified in expending money that had been appropriated for other special objects.

Commissioner Gibbens gave a detailed history of the Board of Electrical Control, its organization, rules and regulations, its work and the various obstacles that it had had to contend with.

Juror Leo wanted to know why the Commission hadn't made some stir to secure an appropriation for putting the wires under ground. Mr. Gibbens replied that that wasn't the business of the Commission.

Mayor Hewitt was then summoned to the witness stand and interest in the proceedings increased.

"Upon whom devolves the duty," asked the Coroner, "under the law, of ordering the removal of the electric-wires and poles in this city?"

"That's a question for a lawyer," replied Mayor Hewitt, sharply. "The duty is imposed by law and the Coroner can consult the statutes and make up his own mind about it."

Coroner Levy (with asperity)—I should like to have a more direct answer.

Mayor Hewitt—You asked me to construe the law.

Coroner Levy—I didn't.

Mayor Hewitt—I am here as a witness to give testimony. You ask me to inform you whose duty it is to remove the poles and wires in the streets. That duty is imposed by law. The statute is open for you to consult. I am not here to construe the law. I want to say frankly (addressing the jury) that I have been accused of trying to snub the Coroner and snub the jury. I have no such desire. I will answer any questions upon which I have knowledge without raising the question of knowledge.

The Coroner asked the Mayor why he had not given a written order for the removal of the poles and wires.

Mayor Hewitt (tartly)—Because it was none of my business. I will tell the jury, not because there is any propriety in the question, but because the Mayor's motives and actions are not reviewable by the Coroner.

Coroner Levy (resentfully)—I don't think that you have any right to come here and criticise the methods of the Coroner, who is trying to do his duty.

Mayor Hewitt—The Coroner criticised the action of the Mayor the other day. Did he not say that the conduct of the Mayor was very reprehensible?

Coroner Levy (confused)—But that was not in court.

Mayor Hewitt—Well, then, you criticised me, and I thought a cat might venture to look at a king.

The jury and spectators laughed. The Mayor had won the bout. The Coroner's stock of repartee was not equal to the emergency. The Mayor then addressed himself to the jury. He said:

The request made by the Board of Electrical Control was submitted to the Mayor. The statutes provide that it shall be the duty of the Commissioner of Public Works to remove the poles and wires upon the written order of the Mayor. Plainly it imposed upon the Mayor the duty of considering whether he should give such an order or not. The duty was mandatory upon the Commissioner of Public Works. It was not mandatory upon the Mayor. The Mayor must look over the whole field, for he has many interests that concern the city to look after. Above all, he has to consider whether, if he gives the order, it can be executed, whether there were any means available for the execution of the order. Nothing can be more injurious to the public service than for the executive to give orders that cannot be carried out. The Commissioner of Public Works informed me that he had no money available for the purposes. His unexpended balances were required for purposes that had been specified at the time the appropriations had been made. His answer was communicated promptly to the Board of Electrical Control. If he had informed me that he had the means to execute the order I should then have had to take a wider view of the subject.

The Mayor then referred in detail to other difficulties that stood in the way of the execution of such an order. No sane man would attempt to remove wires through which death-dealing currents were passing. An invasion of the stations to stop the currents would be "promptly and properly resisted." A summary removal of wires and poles would leave a large number of busy streets in darkness. More deaths and accidents would result from that than had ever been caused by overhead wires. The public wouldn't stand it. The Corporation Counsel had informed him that the Subway Commission was without authority to enforce the putting of wires into the conduits.

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We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

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Rumor has it there is another big electric light consolidation in prospect; don't go too fast, gentlemen.

The next meeting of the National Telephone Exchange Association will be held in New York, commencing on Tuesday, September 4. This is the week following the meeting of the National Electric Light Association, which commences at the Hotel Brunswick, August 29.

The Cincinnati Press Club dedicates its headquarters at the Centennial building, in that city, June 9th, at seven o'clock, P. M. The occasion will undoubtedly be an interesting and impressive one. The REVIEW staff desires to acknowledge a very courteous invitation to be present.

The "world to conquer" that seems to be left to electricity is that of aerial transportation—not of messages and signals, but of passengers and freight. Flying machines are attracting more than usual attention, and in nearly all of them stored electricity figures as the motive and controlling power.

We confess to a liking for Mayor Hewitt. There is much clear, keen good sense in his remarks on the electric wire situation in this city, published in another column. We hope he will not neglect to attend the meetings of the Board of Electrical Control, and give strength and wisdom to an otherwise weak and inefficient official body.

No incandescent lighting company can afford to disgust their customers by overloading the generators, and thus permitting an inevitable and decided drop in pressure at the lamps, for the mere sake of a few cents more profit per night. We have heard of several cases lately, and we warn such companies that customers will not stand it long. They will do well to add to their generator capacity.

In the large country towns of England electric light continues to make good progress. Numerous schemes are on foot for street lighting in the west and north of England. In Taunton a local company has now been at work more than a year, and in Exeter, Bath, Buckingham, Bradford, Southhampton, and other places, different systems for the establishment or extension of electrical works are being ardently discussed Great opposition, however, is almost always met with owing to the fact that many of the town councillors are usually large shareholders in local gas companies. Moreover, the would-be economist invariably objects on the ground of extravagance, failing to see that a very slightly increased expenditure is met by a very largely increased illuminating power. It is unfortunate that the question should be put in the hands of a body of men so prejudiced and ignorant of the subject as the ordinary English country town council.

Speaking of alternate current motors, our contemporary, London *Electrician*, thus epitomizes the Ferraris apparatus: "By means of the combination of two alternating fields displaced by a quarter phase" he "obtains the practical equivalent of a rotating field." The meaning is quite plain, of course, to those familiar with the general science. In our article of May 12th, on the Tesla motor, we used the following language: "And these two circuits are connected with the field magnet coils of the motor in such manner that the alternating impulses in these two circuits will produce a *continuous rotary shifting of the poles of the field-magnet.*" This too is quite plain, and we, at the time, were expressly precluded from more specific description by the inventor requesting that we should not fully anticipate his own technical description. Yet *Electrician* says of our description, "but we confess that we are unable to make head or tail of the details." This is too bad—for *Electrician*. We are at all times willing and glad to furnish news, and even sometimes a chromo thrown in, but we positively decline to top it off with an installment of brains.

HIRSUTE ELECTROLYSIS.

The method of destroying hair follicles in the pores of the skin by means of a needle heated to incandescence by an electric current after insertion, has set many a woman rejoicing in the annihilation of moustaches of various degrees of visibility, or perhaps in the path made between meeting eyebrows, or even in the destruction, root and branch, of a stubborn tuft of hair growing from cheek or jaw like sedge grass in a field; and she has thanked electricity for the removal of at least one incubus to beauty, doubtless relating in confidence the depilatory experience as one of the wonders of that "great force."

But is it truly a wonder when a white-hot platinum needle singes out the root of the hair that it kills the hair? How could it be otherwise? "What is to hinder?" as the man said when called upon to admire the Falls of Niagara as a great wonder of nature. And he gave a description of his idea of wonder that the water should flow up the stream and ascend the falls.

In this case the method used would be much more truly wonderful if the dermatologist should reverse the action of his apparatus and raise a capilliary crop, *ad libitum*. As Carlyle says, "Instead of carrying the torch for burning, let him wield the hammer for building."

Picture to yourself a gilded youth sitting in an operating chair like those in tonsorial emporiums, having side whiskers or moustache germinated according to the whim of the hour, while there could be a ressurection on the shiny occupits of those whose foreheads extend pretty well towards the spinal column.

If Captain Gulliver, of blessed memory, gave as his judgment that the man who caused two blades of grass to grow where one grew before was worthy of the prize offered by the king of Lilliput, how much more shall be the reward of those who cause spears of hair to grow where none grew before—that is, since before the war.

As the locomotive has not dispensed with the service of horses, so the second form of this apparatus would not obviate all needs of its present application. For, in addition to the purposes before alluded to, there would still remain men desiring more or less of a beard removed, yet not wishing either to shave or to be shaved; and then there would still be those desirous of posing as a phrenological phenomenon, who would have the area of the forehead enlarged accordingly.

All these matters furnish a promising field for those who can reverse the action of hir sute electrolytic process, and raise capilliary crops. The field may not be entirely overrun, for there are everywhere persons who, like the knight in Hudibras,

"Can discern and divide
The hair 'twixt south and southwest side,"

and some may yet have their old preferences for hair-cut and shave, while others may be so lost to youthful vanity as to preserve their denuded scalp in all its present polish.

IS THIS AN ENGLISH JOKE?

Says the London *Electrician:*

"Unless our esteemed contemporary, the ELECTRICAL REVIEW, of New York, has been made the victim of a very silly joke, the Mather Electric Company, of Hartford, Connecticut, are responsible for the introduction of a startling innovation in dynamo-electric machinery. This is nothing less than placing the driving engine inside the armature! From the drawing accompanying the description, the engine appears to be of the Rigg type; it 'is contained within a steam-tight metal casing, upon the outside of which the armature is mounted.' The idea appears to us to be capable of still further development, for why should not the boilers be put inside the field magnets?"

—or some gumption be inserted into the cerebral cavities of the exchange editor of our transatlantic contemporary? Where is the joke? We stated the idea to have been just patented, but perhaps our contemporary's files do not contain the *Official Gazette* of the U. S Patent Office. Still, with all deference, we prefer the authority of the *Official Gazette*. Nor was it stated that the Mather Company had "introduced" the invention. But it is not improbable that they will, and notwithstanding the unfounded raillery of our contemporary, there is not a reason why it should not prove successful for the uses proposed.

OUR CHICAGO LETTER.

(Special Correspondence.)

The American Bell Telephone Company has commenced proceedings against the Cushman Telephone Company in Judge Blodgett's court at Chicago. Mr. E. D. Easton, of Easton & Johns, stenographers, Washington, D. C., is in the city to take testimony in the case, and has brought with him one of Bell's perfected graphophones, into which the shorthand testimony will be read for preservation.

In St Louis on the 31st, the Bell Company was made defendant in a case before a police justice, for violating the ordinance prohibiting telephone companies from charging more than $50 per annum for the use of an instrument. Judge Cady held that the ordinance was right, and fined the company $300.

Every now and again there is a spasm in either the law or the health department on the subject of smoke, and somebody gets pulled under the ordinance which says it's wrong to let your chimney smoke within the city limits. Illinois and Indiana coal knows no such law, and so every time you burn it you are liable to have the authorities after you. The last spasm struck high, hitting the board of trade, one newspaper, a brewery, two or three hotels, an express company and an electric light company, and yet we call this a free country, where our mental as well as physical nourishment, and even our light product can be interfered with on account of a little smoke in the atmosphere! Go to!

On the 28th inst., Mr. M. W. Plake, a trimmer for the Arc Light and Power Company, received a considerable shock while at his work, and gave the papers a chance to remark on the dangerous wires—but Mr. P. was not injured so, but that he was at work again in a couple of days. It served for a "chunk" for the reporters, however, and that was all sufficient.

May was a very crabbed, ill-natured month in its last days. From Virginia to Nebraska, the storms of that period were particularly destructive of human life. Many cases of lightning stroke were reported, and buildings were ruined by scores, either through wind, water or lightning, often accompanied by nearly unprecedented hail storms. In Des Moines, Iowa, a hail storm occurred which left drifts of these stones several inches deep, and the immense size of some of the pebbles has induced the average liar in that part of the country to change the comparative of size from the traditional hen's egg to a "league ball."

At Mentone, a little place in Kosciusco County, Indiana, a young damsel was standing near her home Sunday evening, when a lightning stroke passed through her hair, bending two hair pins, and melting one; but the skin of her head was not broken, and the young lady was uninjured.

Ida Cline, at Woburn, Ill., didn't fare quite so well. She was with her father and two others in a barn, whither they had gone for shelter, and was struck dead. The other three were knocked insensible, but recovered.

Lightning played havoc around Chicago on the 27th and 28th. A residence at 106th street was struck, fired and nearly demolished. A dwelling near Forty-eighth and Paulina was struck, and a church at 750 Dickson street, together with a residence next door, was considerably damaged.

A storm was quite general through Ohio, Illinois, Iowa, Nebraska and Kansas, culminating at Chadron, Nebraska, in a waterspout, which deluged miles of territory. A local correspondent says, shortly after six o'clock on Saturday (26th), in the northwestern part of Dowes County, a huge revolving black cloud appeared in the heavens. The nearer it came the more rapidly it revolved. The cloud broke in the vicinity of White River and Lone Tree Creek. The water came rushing down White River in a solid wall ten feet, the river rising sixteen feet in forty minutes. All through the northern half of this State the same sort of elemental commotion is recorded, and at Abilene, Kansas, a cyclone (the REVIEW

always means tornado when it says cyclone) was reported as having raised the mischief in Dickinson and Clay Counties. The details are but a repetition of the "old, old, story." Wind, rain, hail, prostrate trees, fences, houses, stacks, the usual number of picked chickens and twisted dwellings, and, fortunately, nobody killed outright.

A long, complicated and interesting case reached a conclusion in Judge Clifford's court, at Chicago, on the 29th ultimo. The case, which is of importance to holders of stock in such companies was that of Elias R. Bowen, Receiver of the Great Western Telegraph Company *vs.* A. J. Hoagland, a Board of Trade man, who was a stockholder in the company. The result of the trial affects 2,000 stockholders. The Great Western Telegraph Company being insolvent, a receiver was applied for in 1874. Elias R. Bowen, the receiver, found that the assets could not satisfy the creditors. Application was made to Judge Tuley, and a decree was entered assessing the 2,000 stockholders 35 per cent. of the par value of each $25 share of stock. About fifty suits were commenced against individual stockholders. Hoagland's is the first tried, and the $875 verdict represents 35 per cent. of 100 shares of stock. He had paid $1,000, but many other stockholders have not paid a cent. The indebtedness of the company amounted to $400,000. Thomas Sutherland, who is prosecuting the suits against the stockholders, said: "The facts are pretty near as Judge Sherwood, of the the Missouri Supreme Court, stated them. Judge Sherwood said: 'There have been many devices, many schemes, many cunningly devised transactions where men have sought to receive every benefit and yet shirk every burden incident to the position of a stockholder. But such devices have generally came to naught. The courts have been sedulous in their endeavors to bring about such a result.'"

This case of Hoagland having resulted in the receiver's favor, the other stockholders will be proceeded against, and the creditors of the company who have waited fourteen years for their money will doubtless receive it.

The Western Light and Power Company, of Chicago, was recently organized; W. M. Talcott, Frank Ives, and Carlton Prouty, incorporators. The company has already procured franchises in townships bordering on the city, and its general manager, Mr. W. M. Talcott, is confident of doing a large business in central station lighting in and around Chicago.

There has been a large amount of sentiment expended on the danger that lurks in strong drink. The other day at Milneburg, Louisiana, a couple of gentlemen with unpronouncable Latinish names had a soft drink stand. They sold only soda, black pop, ginger ale, and that class of harmless Sunday school beverages.

On the 28th a sudden storm came up, and the partners, with an additional hand, undertook to roll up the awning which shaded their place of business. The three were struck by lightning, and the two partners killed. The third was but partially killed—let off with a warning, as it were, to stick to apples, pea nuts and *bannan-nose*, and let soft drinks alone. C. C. H.

Chicago, June 4, 1888.

Electric Club Notes.

There were twenty-eight new members elected at the last election meeting of the Board of Managers.

The engine gave out at the Electric Club one night last week, but the storage batteries furnished electric current until it was fixed.

George Parsons Lathrop, the well known magazine writer and poet, takes a warm interest in electrical matters and was recently elected a member of the club.

The largest individual subscription to the bonds of the club was by Mr. Theo. N. Vail. The largest subscription from any company was from the Metropolitan Telephone and Telegraph Company ($2,500) of which Mr. Vail is the president.

On Thursday, June 7th, of this week, Mr. C. J. Field, chief engineer of the Edison United Manufacturing Company, and a member of the club, was married to Miss Agnes M. Craven, of Montreal, Canada. All Mr. Field's friends will extend congratulations.

OUR PHILADELPHIA LETTER.

(Special Correspondence.)

You must not be surprised if items of Philadelphia news have an ancient mustiness about them; we have to go over to Gotham occasionally, as you know, to imbibe knowledge and other things at your charming Electric Club, but when we return, we find that even our principal street is the same old "Chestnut."

This is an exordium to prepare you for an old story, related the other day by one of our city officials, apropos to the usefulness of the new Gamewell Auxiliary Fire Alarm system. He referred to the fire that occurred some months ago at Blabon's oil-cloth factory in the outskirts of the city, and said he was at the headquarters of the Fire Patrol on Arch street when one of Blabon's clerks came rushing across the street from their downtown office, showing a telegram just received over their private wire from the factory, to the effect that it was on fire and a serious conflagration was imminent. "Would the patrol please turn in an alarm?" No; they were not authorized to do that, but could call up the Fire Department on the telephone, give them the desired information, and ask them to turn in an alarm. This was done, but here another hitch arose, since the department was not permitted to sound an alarm unless received through the regular medium of the street box nearest the burning factory. How long do you suppose the clerk had to wait at the patrol headquarters until these formalities were observed? Nine blessed minutes; and by the time the engines reached the scene the fire was beyond immediate control, and a heavy loss ensued. "Now," said the official, "if the Blabon's had had one of those little Auxiliary boxes at the factory, by a single electrical touch every engine in the district would have been summoned within a few seconds from the discovery of the fire."

Tisdall, of the Brush Electric Company office, 53 South Third street, is shaking hands with himself and all congratulating friends, over his recent capture of that big mill in Wilmington, Del., for "incandescence" lighting. Tisdall rarely makes a joke, but when he does, it's a ten strike. Witness his latest aphorism: "The wise mill owner is like the wise fox hunter, and always takes the '*brush*.'"

The new station of the Philadelphia Edison Company comes on very slowly, but when it does "get there," it will be the stateliest building of its kind in America; but if it takes three months to lay the foundation, how long will it take to put up the six or seven stories? The company has the most ample financial backing and the services of a noted electrical engineer in charge of the construction, but there is apparently something lacking, and I occasionally wonder if the addition of a plain, every-day electric light man would not bring about the happy combination of "audacity and pathos," which the Irishman said was needed in "courting widows," and let me add, in starting electric light companies.

We are told that, in the millennium, the lion and the lamb shall lie down together, and it seems to me that the electrical millennium is foreshadowed in the installation just completed at the pocket-book factory of William A. Haines, on North Seventh street, for the dynamo is an Edison, the lamps are Sawyer-Man, the storage battery is of the Julien type, and the wiring and installation contract was awarded to Holbrooke, although the actual work was done by those clever young friends of his, Harrington and Griffith, of the Enterprise Electrical Company. I have seen T.-H. arc lamps run from Schuyler dynamos, and who shall say but some day we shall see T.-H. regulators on machines of even the American Company?

Wilbur, of the Fort Wayne Jenney, is sighing for new worlds to conquer, and states emphatically that "no pent-up Utica (N. Y.) contracts his power." He tells me he has several excellent prospects for Slattery alternating plants in this neighborhood, and, with his push and popularity, it will be strange if some of these prospects do not become realities in the near future.

I see you mention in your last number that T. Carpenter Smith, of the Allegheny County Light Company, is to again take up his residence among us, and I can affirm the rumor, for I have just taken dinner with the "Adonis," at the Bullitt Building, and detecting about him an unusual effulence in the shape of a new watch and chain, asked for a look at it, and found that it was presented on the occasion of severing his connection with Pittsburgh by his fellow-workers in the Westinghouse vineyard. It was, of course, selected for its usefulness as well as beauty, and consequently has all the latest requirements in the way of a Geneva non-magnetic spring, etc.

Here I must stop, for Colonel Cleverly has just dropped in to tell me how many Baxter motors he has sold recently, and I know the list must be too long for the fag end of a letter. LETTUCE.

Philadelphia, June 4.

Use of Electro-Dynamometers for the Measurement of the Mean Intensity of an Alternating Current.

Objections having been raised to the use of electro-dynamometers for measuring alternating currents owing to their self-induction, the authors have investigated both theoretically and experimentally the extent of the error introduced. Two types of electro-dynamometers were selected, the Siemens, in which the two coils are in series, and the Carpentier, in which they are in parallel. In the former the readings are proportional to the square of the current traversing both coils; in the latter, to the product of the two currents traversing the two coils independently. In both the mutual induction is eliminated and the self-induction becomes a constant quantity, since the two coils are always at right angles.

The simplest case of an alternating current is the Siemens machine, since the revolving coils have no iron cores, and its coefficient of self-induction may be considered constant. According to Mr. Joubert, the value of the variable current, i, at any moment, t, must satisfy the differential equation.

$$R\,i + L\frac{d\,i}{d\,t} = E_o \sin.2n\frac{t}{T},$$

where R is the resistance, L the coefficient of self-induction, E_o the maximum value of the E. M. F. of the whole circuit, and T the time of an entire period. From this equation it follows that

$$I_m = \frac{E_o}{R\sqrt{2}}\cdot\frac{1}{\sqrt{1+\frac{4\pi^2 L^2}{T^2R^2}}}.$$

If now a Siemens electro-dynamometer of resistance r and self-induction l is introduced into the main circuit, the above equation becomes

$$I'_m = \frac{E_o}{(R+r)\sqrt{2}}\cdot\frac{1}{\sqrt{1+\frac{4n^2(L+l)^2}{T^2(R+r)^2}}}.$$

Comparing these two values of the mean current, we obtain the fraction

$$\frac{I'm}{Im} = \frac{R}{R+r}\sqrt{\frac{1+\frac{4n^2}{T^2}\cdot\frac{L^2}{R^2}}{1+\frac{4n^2}{T^2}\cdot\frac{(L+l)^2}{(R\times r)^2}}}$$

the second term of which expression shows the disturbing effect of the instrument.

In the case of the Carpentier electro-dynamometer, the corresponding equation is

$$\frac{I'm}{Im} = \frac{\sqrt{r\,r'}}{r+r'}\sqrt{\frac{1+\frac{4n^2}{T^2}\cdot\frac{l}{r'}\cdot\frac{l'}{r''}}{1+\frac{4n^2}{T^2}\cdot\frac{(l'+l'')^2}{(r'+r'')^2}}}$$

where r', r'', l', l'' are the resistances and coefficients of self-induction of the two coils of the instrument.

The results of calculation and of experiment show that an electro-dynamometer, placed in the main circuit of an alternate current machine, has an effect on the mean intensity which depends on the periodic time, T, and increases when the latter diminishes. This disturbing effect is greater when the two coils of the instrument are parallel than when they are in series. But in both cases in does not exceed one per cent. of the mean current, at any rate for speeds up to 1,500 revolutions per minute. In the case of alternating currents of shorter periodicity, the mean value could always be measured with the same degree of approximation, provided that the coefficient of self-induction of the electro-dynamometer were diminished in proportion as the speed was increased.

The American Electric Construction Co., lost considerable apparatus by fire Monday morning in a warehouse. The goods were insured.

Personal.

Henry Dwight Stanley visited and conquered Chicago last week.

Mr. Willard L. Candee is enjoying a visit to the booming cities of the West, and will be absent two weeks.

Mr. Alfred J. Gustin, ex-manager of the Southern Telegraph Company, died last week at Savannah, Ga.

Dr. George G. Baker, of Akron, Ohio, has moved to Denver, Col. A farewell reception was tendered him by his friends.

Mr. D. W. Baker, of Baker & Co., platinum refiners, of Newark, accompanied by his wife, left for Alaska this week, to be absent three months.

Gen. C. H. Barney, of the Sawyer-Man Electric Company, was the recipient of a very enjoyable dinner at Young's Hotel while in Boston recently.

The New York agents of the Sprague Motor Company, Messrs. P. A. Dowd and Geo. W. La Rue, have established their headquarters at No. 239 Broadway.

The Wilkesbarre, Pa., telephone exchange is to be fitted up with the multiple system, which will be ready for use about August 1st.

Col. H. G. Moehring, of Frankfort-on-Maine, is in the city investigating electric light matters. The colonel will represent the Sawyer-Man Electric Company in his country on his return.

Mr. Marean, of the firm of Royce & Marean, Washington, D. C., was a recent New York visitor, and in his travels was greatly surprised to have so many points given him concerning his widely known and truly good partner, the Honorable F. Woolly Royce.

Messrs. C. R. Vincent & Co. have opened an office at 15 Cortlandt street, New York, and will handle the Ball engine, the Skinner engine, and the Wainwright feed-water heater. This is an enterprising and experienced company, and they will undoubtedly secure a fine business for the popular line of machinery represented.

Mr. Thos. A. Edison received the congratulations of his friends last week, over the fact that he had become the father of a little girl Thursday morning. Mother and child are doing well and the great electrician is quite happy. Mr. Edison now has four children; two boys, aged ten and twelve years, and the oldest a young lady of sixteen

Mr. T. B. Doolittle and Mr. H. V. Hayes, tiring of the views above ground, recently visited the regions of a coal mine, some 1,400 feet beneath the earth's surface, at Lost Creek, Penn. They traveled over a mile underground, and on their return, were so well coated with black that they could easily have passed for miners. The report that Doolittle fainted while "down in the coal mine," when a small chunk of slate-stone fell on him, is not believed by his telephone friends.

Mr. Edison says that Prof. Muybridge, the instantaneous photographer, visited him lately and proposed to him a scheme which, if carried to completion, will afford an almost endless field of instruction and amusement. The photographer says that he has been conducting a series of experiments recently and has almost perfected a photographic appliance by which he will be enabled to accurately reproduce the gestures and the facial expression of, for instance, Mr. Blaine in the act of making a speech. This was done, he said, by taking some sixty or seventy instantaneous photographs of each position assumed by the speaker, and then throwing them by means of a magic lantern upon a screen. He proposed to Mr. Edison that the phonograph should be used in connection with his invention, and that photographs of Edwin Booth as Hamlet, Lillian Russell in some of her songs, and other artists of note should be experimented with. Mr. Edison, he said, could produce with his instrument the tones of the voice, while he would furnish the gestures and facial expression. This scheme met with the approval of Mr. Edison, who expects to perfect it at his leisure.

TELEGRAPHIC

.... The annual meeting of the American District Telegraph Company, of Philadelphia, was held last week. The following officers were elected: President, C. Hartman Kuhn; vice-president, Theodore M. Etting; secretary, M. Richards Muckle; directors, Edward J. Mathews, T. Morris Knight, George Kelly, John Rommel, Jr., Edward C. Platt, Henry Nuss, Jr.

.... The Philadelphia Telephone Company have contracted with Mr. Frank T. Wyckoff, of Williamsport, Pa., for wooden conduits for their underground wires in Philadelphia, Pa. Mr. Wyckoff has furnished large quantities of his ducts for underground wires, including over 30 miles for the New York City subways, several miles for the Western Union Telegraph Company, which they have used in various cities, and for the subways in Chicago. He has just forwarded two miles to the Electric Light Company of Springfield, Mass. Many other electrical companies are using his conduits.

.... A branch of the Order of Railway Telegraphers of North America has been established at North Adams, Mass., composed of operators on the Fitchburg Railroad. Officers were elected for the ensuing year, and installed, as follows: Chief telegrapher, F. E. Gurney; assistant chief telegrapher, G. M. Rounds; secretary and treasurer, A. E. Ingraham; senior telegrapher, P. M. Mocklar; junior telegrapher, A. D. Wallace; inside sentinel, J. T. Shaughnessy; outside sentinel, G. M. Hawkes; past chief telegrapher, J. F. Keating. The following gentlemen and one lady are charter members: F. E. Gurney, A. E. Ingraham, A. D. Wallace, G. M. Rounds, G. M. Oakes, E. V. Warren, Miss Carrie E. Elmer, P. M. Mocklar, G. M. Hawkes, G. L. Glass, A. C. Hoag, F. R. Dann, C. H. Leonard, J. T. Shaughnessy, W. J. Stevens, F. E. Hawkes, H. R. Miller, T. M. Coyne, A. J. Marsh, F. M. Beedleson, A. G. Little, A. H. Banker, F. M. Castelloe, E. L. Parker, S. H. Fales, H. S. Chapman, J. F. Keating, O. A. Matson and N. S. Tandy.

It was voted to christen the lodge "Hoosac Tunnel Division," in honor of the famous tunnel in the mountain of that name. This division is about the eighty-fifth chartered by the grand division. There are two other divisions in Massachusetts—Bay State, of Boston, and Quinsigamond, of Worcester.

Theory of Telephone Conductors.

The chief factors influencing the propagation of the rapidly-altering undulations with which we have to do in telephonic currents, are the resistance of the line, its self-induction, its capacity, and the leakage to earth or to neighboring wires, to which may be added the polarization of the dielectric; this latter becomes of importance where we have to deal with portions of a line which for any special reason may have to be placed underground.

The good quality of a telephonic transmission is determined by the strength and clearness of the sounds reproduced. By suitable construction of the apparatus it is always possible to insure sufficient strength. In order to transmit speech well, it is necessary that the several notes which go to make up one sound should be reproduced with great clearness, otherwise the sounds get mixed, and mistaken one for another. Now the four previously mentioned factors influence the clearness of the transmitted words, chiefly on account of their action on the phase of the undulations. Their influence may be summarized thus:

1. The greater the resistance and the leakage, the smaller is the strength of the received current.
2. Self-induction favors high notes.
3. Capacity favors low notes.
4. The resistance diminishes the effect of self-induction and increases the effect of capacity.
5. Leakage diminishes the effect of capacity and increases the effect of self-induction.
6. In a conductor having both self-induction and capacity, the relative intensity of the undulations increases and decreases periodically with the rise in the height of the note.
7. The magnetic permeability and the polarization of the conductor destroy the clearness of the transmission.

It follows that the best possible conductor is one in which resistance, leakage, capacity and self-induction are each as small as possible. A looped circuit, consisting of a copper wire three mm in diameter, seems best to fulfill the several conditions. The resistance of such a wire is about five ohms per kilometer; the self-induction is about 0.001; the capacity 0.01 microfarad; and by the use of suitable porcelains the insulation resistance may be brought up to 100 megohms.

The question naturally arises if it is not possible to counteract the defects of underground wires, the capacity and polarization of which must be made greater than in the case of aerial lines. From the laws 2 and 3 it would appear that improved transmission would result from connecting up a line with much capacity to one with large self-induction. As, however, the capacity can only be altered within narrow limits, and the self-induction only admits of treatment by using iron instead of copper wire, while the leakage may vary, according to the state of the weather, from 10 megohms to 1,000 megohms, such a joining up of lines with different properties cannot be carried out practically. Nor can artificial lines be used with any better result. It is well known that the capacity of condensers and the self-induction of solenoids can compensate each other; but their application to telephone lines only makes matters worse than before.

A glance at the physical meaning of these two quantities will make this clear. The dimensions of self-induction are $[l \cdot^1, s^2]$, those of capacity $[l]$, in electrostatic units; the product of the two is therefore the square of the unit of time. The action of self-induction is instantaneous, and the effects are produced simultaneously at every point of the conductor: consequently the current is the same in every point at any definite instant. The capacity, on the contrary, acts gradually on the current, so that it is less at the far end of the conductor than at the beginning; consequently in a conductor having appreciable capacity the current is different in every point at any definite instant.

Due attention seems now to be paid to the necessity of reducing the four main disturbing elements to a minimum in building long lines; but in the network of conductors in towns this is not the case. The resistance is often very great and might be reduced to one-third; the capacity of telephone cables is a maximum instead of a minimum; the the leakage, which should be as equal as possible, varies from 1 to 1,000; the self-induction of the lines is often unnecessarily increased by the introduction of electromagnets.—*Elektrotechnische Zeitschrift.*

.... A company of St. Paul capitalists is knocking at the door of the city of Milwaukee, Wis., for the privilege of establishing an electric light plant on the south side exclusively. The Badger Illuminating Company has been trying to get to that side of the river. Both are now running a lively race to get the field first, so that the prospects are good for that sort of illumination in that district within ninety days. The St. Paul capitalists who are seeking a franchise are represented in Milwaukee by Thomas Phillips. The company is styled the Northwest Electric Construction and Supply Company, and they want a franchise for half a century. By the terms of the franchise which they have asked for, no restrictions are made as to the stringing of wires on poles. It is stipulated, however, that work is to be commenced not later than ninety days after the passage of the ordinance, and in case the plant is not in operation within six months thereafter, the franchise will become null and void.

A Really Good Telephone Story.

BY BRANDER MATHEWS IN "CENTURY" FOR JUNE.

It was a suggestion of Hawthorne's—was it not?—that in these more modern days Cupid has no doubt discarded his bow and arrow in favor of a revolver. There are ladies of a beauty so destructive that in their presence the little God would find a Gatling gun his most useful weapon. It is safe to say that the son of Venus does not disdain the latest inventions of Vulcan for the use of Mars, and that he slips off his bandage whenever he goes forth to replenish his armory. Lovers are quick to follow his example, and the house of love has all the modern improvements. Nowadays the sighing swain may tryst by telegraph and the blushing bride must elope by the lightning express; and if ever there were an Orlando in the streets of New York, he would have to carve his Rosalind's name on the telegraph poles.

If the appliances of modern science had been at the command of Cupid in the past as they are in the present, the story of many a pair of famous lovers would be other than it is. Leander surely would not have set out to swim to his mistress had international storm warnings been sent across the Atlantic, which Hero could have conveyed to him by the Hellespont Direct Cable Company. Paris might never have escaped scot-free with the fair Helen if the deserted husband and monarch had been able to pursue the fugitives at once in his swift steam yacht, the *Menelaus*. And had Friar Laurence been a subscriber to the Verona Telephone Association, that worthy priest would have been able to ring up Romeo and to warn him that the elixir of death which Juliet had taken was but a temporary narcotic, and then might Romeo find that

> Beauty's ensign yet
> Is crimson in thy lips and in thy cheeks,
> And death's pale flag is not advanced there.

II.

As the centuries succeed one another, society becomes more complicated and science develops in all directions; thus is an equilibrium maintained, and the modern lover is aided by the appliances of science as he is hampered by the intricacies of society, even the charity fair, that final triumph of the amateur swindler, and the telephone, that unpoetic adjunct of the shop and the office, can be forced to do love's bidding and to serve as instruments in the cunning hands of Cupid.

When the young ladies who were spending the summer at the seaside hotel at Sandy Beach resolved to get up a fair for the benefit of the Society for the Supply of Missionaries to Cannibal Countries, they had no more hearty helper than Mr. Samuel Brassey, a young gentleman recently graduated from Columbia College. He was alert, energetic, ingenious, and untiring; and when at last the fair was opened the young ladies declared that they did not know what they would have done without him. He it was who helped to decorate the ball-room, and to arrange it as a mart for the vending of unconsidered trifles. He it was who devised the Japanese tea stall for Mrs. Martin, and suggested that this portly and imposing dame should appear in a Japanese dressing-gown. He it was who aided the three Miss Pettitoes, then under Mrs. Martin's motherly wing, to set up their stands—the Well, where Miss Rebecca drew lemonade for everyone that thirsted; the Old Curiosity Shop, where Miss Nelly displayed a helter-skelter lot of orts and ends; and the Indian Wigwam, in the dark recesses of which Miss Cassandra, in the garb of Pocahontas, told fortunes.

To Miss Cassandra, who was the eldest and most austere of the three Miss Pettitoes, he suggested certain predictions for certain young men and maidens who were sure to apply to the soothsayer—predictions which seemed to her sufficiently vague and oracular, but which chanced to be pertinent enough to excite the liveliest emotions when they were imparted to the applicants. For Miss Nelly he wrote out many autographs of many famous persons, from Julius Cæsar and Cleopatra to Queen Elizabeth and George Washington; the signatures of Shakspere, of which there were a dozen, he declared to be eminently characteristic, as no two were spelled alike; and the sign-manual of Confucius he authorized her to proclaim absolutely unique, as he had copied it from the only tea-chest in the hotel. To him also the sirens of the bazar owed their absolute conviction of the necessity of giving no change. Furthermore, he elaborated a novel reversal of the principle of a reduction on taking a quantity: the autographs at the Old Curiosity Shop, the glasses of attenuated lemonade at the well, and the little fans at the Japanese tea-stall, were all twenty-five cents each, three for a dollar. This device alone stamped him as a young man with a most promising head for business; and so Mr. Martin declared him, after asking if the autographs were genuine and being promptly offered a "written guarantee from the maker."

From these details it will be seen that Mr. Samuel Brassey was on most friendly terms, not to say familiar, with Mrs. Martin and with her charges, the three Miss Pettitoes. He was equally frank and open with all the other young ladies in the hotel, except, it may be, with Miss Bessy Martin. In his relations with Mrs. Martin's handsome niece a persistent observer might have detected a constraint, often cast aside and often recurring. The rest of the girls met him with the sincerity and the unthinking cordiality which are marked characteristics of the young women of America, especially when they chance to be at a summer hotel. So indeed did Miss Martin—but to her his bearing was different. Towards the others he was kindly. To her he was devoted and yet reserved at times, as though under duress. The least bashful of young men ordinarily, in her presence he found himself shy and not always able to compel his tongue to do his bidding. If she looked at him—and he was a pleasant-faced young fellow—he found himself wondering whether he was blushing or not. Out of her sight he was often miserable; and under her eyes he suffered an exquisite agony. He hovered about her as though he had words of the deepest import trembling on his tongue, but when he sat by her side on the piazza, or danced a Virginia reel opposite to her of a Saturday night, or walked with her to church of a Sunday morning, he had nothing to say for himself.

Whether or not Miss Martin had noted these symptoms, or what her opinion of Mr. Brassey might be or her feelings towards him, no man might know; these things were locked in her breast. The face of a virgin before the asking of the question is as inscrutable as the visage of the Sphinx propounding its riddle. Miss Martin treated Sam as she treated the other young men. She allowed him to help her in the organization of the post office department of the fair. She was to be the post-mistress; and with Sam aiding and abetting, a letter was prepared for every person who could possibly apply for one—a missive not lacking in spice, and not always shown about by the recipient.

At Sam Brassey's suggestion, the post office had been arranged as a public pay station of the Seaside Hotel Telephone Company—so a blue and white sign declared which hung over the corner of the ballroom where the letters were distributed. He had set up a toy telephone in the post office, with a line extending to a summer house in the grounds, about two hundred feet from the hotel. Any person who might pay twenty-five cents at the post office was entitled to go to the summer house and hold a conversation by wire. The questions which this casual converser might choose to put were answered promptly and pointedly, for Bessy Martin was a quick-witted and a keen-sighted girl.

So it happened that these telephone talks were a captivating novelty, and during the final evening of the fair the bell in the post office rang frequently, and Miss Martin's conversation charmed many a quarter into the little box which Sam Brassey had contrived for her to store her takings.

Sam himself was constant in his attendance at the post office. Although Mrs. Martin or the three Miss Pettitoes might claim his services, he returned to Bessy as soon as he could. Yet he did not seem altogether pleased at the continual use of the telephone. As the evening wore on, a shadow of resolution deepened on his face. It was as though he had made a promise to himself, and thereafter was only biding his time before he should keep it.

About 10 o'clock the ballroom began to empty as the crowd gathered in the dining room, where the drawing for the grand prize was to take place. The committee of management had decided early in the organization of the fair, not to allow any lotteries. Nevertheless, a "subscription" had been opened for a handsome pair of cloisonné vases which Mr. Martin had presented, and every subscriber had a numbered ticket; and now on the last evening of the fair there was to be a "casting of lots" to discover to whom the vases might belong. This much the Committee of Management had permitted. The interest in the result of the "casting of lots" was so intense that most of the ladies who had charge of stalls abandoned them for awhile and deserted into the dining-room.

Then Sam Brassey stepped up to the window of the post office.

"Are you going to see the drawing of the prize, Miss Bessy?" he asked.

"No," she answered; "I shall stick to my post."

"That's all right!" he returned, and a smile lightened his face. "That's all right. Then here's my quarter."

So saying, he placed the coin before her and hurried away.

"But what's it for?" she cried. There was no reply, as he had already left the house.

The ball-room was almost empty by this

time. Mr. Harry Brackett, who had been writing most amusing letters from Sandy Beach to the "Gotham Gazette," was standing before the well and sipping a glass of lemonade for which he had just handed Miss Rebecca a two dollar bill, receiving no change.

"How much of this tipple have you had?" he asked her.

"Two big buckets full," she answered. "Why?"

Mr. Brackett made no reply, but began to peer earnestly among the vines which formed the bower and draped the well.

"What are you doing?" asked Miss Rebecca.

"I was looking for the other half of that lemon," he replied.

Then he offered her his arm, and they went off together into the dining-room to see who should win the prize.

Miss Bessy Martin was left quite alone in her corner of the ball-room. She was counting up her gains when the telephone bell rang sharply. Before she could put the money down and go to the instrument, there came a second impatient ting-a-ling.

"Somebody seems to be in a hurry," she said, as she took her station before the box and raised the receiver to her ear.

Then began one of those telephonic conversations which are as one-sided as any discussion in which a lady takes part, and which are quite as annoying to the listener. The torture of Tantalus was but a trifle compared with the suffering of an inquisitive person who is permitted to hear the putting of a question and debarred from listening to the answer. Fortunately, there was no one left in the ball-room near enough to the post office corner to hear even the half of the conversation now to be set down.

"Hello, hello!" was the obligatory remark with which Bessy Martin began the colloquy across the wire.

Of course the response of her partner in the confabulation was as inaudible as he was invisible.

"Oh, it's you, Mr. Brassey, is it?"

. . . . . ?

"Yes. I wondered why you had run off so suddenly."

. . . . . ?

"You have paid your quarter, and you can talk to me just two minutes."

. . . . . ?

"I like to listen to you, too."

. . . . . ?

"Of course, I didn't mean *that!* You ought to know me better."

. . . . . ?

"What did you say?"

. . . . . ?

"Not lately."

. . . . . ?

"Yes, she had on a blue dress, and I thought she looked like a fright—didn't you?"

. . . . . ?

"Who *were* you looking at, then?"

. . . . . ?

"At me? O Mr. Brassey?"

. . . . . ?

"No; they are not here now."

. . . . . ?

"There's nobody here at all."

. . . . . ?

"Yes; I'm *all* alone—there isn't a creature in sight."

. . . . . ?

"I love secrets! Tell me!"

. . . . . ?

"Tell me now!"

. . . . . ?

"Why can't you tell me now? I'm just dying to know."

. . . . . ?

"I don't believe *you'll* die."

. . . . . ?

"No, there isn't anybody here at all—nobody, nobody!"

. . . . . ?

"Besides, nobody can hear you but me."

. . . . . ?

"Of course, I am glad to talk; what girl isn't?"

. . . . . ?

"Well, it is lonely here, just now.'

. . . . . ?

"I can't chat half as well through a telephone as I can face to face."

. . . . . ?

"Oh, thank you, sir. That was really very pretty, indeed! If you could see me, I'd blush!"

. . . . . ?

"Can you *really* see me in your heart?"

. . . . . ?

"How poetic you are to-night!"

. . . . . ?

"I just *doat* on poetry!"

. . . . . ?

"Well, I do love other things too."

. . . . . ?

"O, Mr. Brassey!"

. . . . . ?

"You take me so by surprise!"

. . . . . ?

"You really have startled me so!"

. . . . . ?

"I never *thought* of such a thing at all!"

. . . . . ?

"You *do?*"

. . . . . ?

"Really?"

. . . . . ?

"Very much?"

. . . . . ?

"With your whole heart?"

. . . . . ?

"I don't know *what* to say."

. . . . . ?

"But I can't say 'yes' all at once!"

. . . . . ?

"Well—I won't say 'no.'"

. . . . . ?

"But I really must have time to *think!*"

. . . . . ?

"An hour? No, a month at least—or a week, certainly!"

. . . . . ?

"It's cruel of you to want me to make up mind all at once."

. . . . . ?

"No—no—*no!* I can't give you an answer right now."

. . . . . ?

"Don't be so unreasonable."

. . . . . ?

"Well—of course—I don't *hate* you!"

. . . . . ?

"Perhaps I do like you."

. . . . . ?

"Well—just a little, little, weeny, teeny bit."

. . . . . ?

"You are very impatient."

. . . . . ?

"Well, if you *must*, you can speak to Aunty."

. . . . . ?

"She's somewhere about."

. . . . . ?

"Of course, she isn't going away all of a sudden."

. . . . . ?

"Yes, I'll keep her if she comes here."

. . . . . ?

"Yes—yes—I'm all alone still."

. . . . . ?

"Good-bye, Sam!"

Miss Bessy Martin hung up the receiver and turned away from the instrument. There was a flush on her cheeks and a light in her eyes. She recognized the novelty of her situation. She had just accepted an offer of marriage, and she was engaged to a young man whom she had not seen since he asked her to wed him. Her heart was full of joy—and yet it seemed as though the betrothal were incomplete. She was vaguely conscious that something was lacking, although she knew not what.

Before she could determine exactly what might be this missing element of her perfect happiness, Mr. Samuel Brassey rushed in through the open door, flew across the ball-room, and sprang inside the partition of the post-office. Ere she could say "O Sam!" he had clasped her in his arms and kissed her.

She said "O Sam!" once more; but she was no longer conscious of any lacking ingredient of an engagement.

A minute later a throng of people began to pour back from the dining-room, and there were frequent calls for "Mr. Brassey" and "Sam."

With a heightened color, and with an ill-contained excitement, Mr. Samuel Brassey came out of the post-office in answer to this summons.

He found himself face to face with Mr. Martin, who held out his hand and cried:

"I congratulate you, Sam!"

The scarlet dyed the countenances of both Bessy and Sam, as he stammered,

"How—how did you know anything about it?"

Before Mr. Martin could answer, the three Miss Pettitoes and Mr. Harry Brackett came forward. Mr. Brackett bore in his arms the pair of cloisonne vases for which there had just been a "casting of lots."

Then Sam Brassey knew why Mr. Martin had congratulated him.

"You have won the prize!" cried Harry Brackett.

"I have—for a fact!" Sam Brassey answered as he looked at Bessy Martin. Their eyes met, and they both laughed.

III.

"Some Cupid kills with arrows, some with traps." Some he compels to sign the bond with pen and ink in black and white, and some he binds with a wire.

. . . . In the case of Kiley *vs.* Western Union Telegraph Company, where it appeared that the plaintiff had been familiar for several years with defendant's telegraph blanks, containing a notice and stipulation wherein it was agreed between the sender and the company that it should not be liable for the non-delivery of unrepeated messages, whether happening by the negligence of its servants or otherwise, the New York Court of Appeals held that he could not recover for damages sustained by the non-delivery of a message, where it appeared that he had not ordered the message repeated, and there was no evidence in the case to show that the non-delivery was due to the misconduct of the defendant or its servants.

The Interesting Discussion of the Wire Problem in New York.

The Mayor, the Comptroller, and the Commissioner of Public Works met as the Gas Commission one day last week, and awarded the contracts for electric street lights for the year ending April 30, 1889. In some of the cases the competing company had no poles and wires up in the district, while the company that bid at the higher figure was all ready for work.

The opinion of the Corporation Counsel was sought, and he held that under the law the Gas Commission could do nothing but ascertain the lowest bidder and award him the contract. This means, of course, the stringing of more electric light wires. When this opinion was read, Mayor Hewitt is reported in the N. Y. *Sun* as saying:

In the present state of the question we must decide whether or not we will extend the area of electric street lighttng. The newspapers have taken it up and discussed its dangers. I believed they have greatly exaggerated them, and I have made some inquiry on my own account.

I find official record of only four deaths from accident due to the high tension current of the arc light systems. Two of the cases were those of line men, who, with their knowledge of the business, must have been careless. At any rate, their deaths were caused by distributing wires, and not by those strung through the streets. But there appear to have been two deaths from loose wires in contact with the light wires or from some defect in insulation—one in East Broadway and one in the Bowery.

There are 7,000 arc lights in the city and such a percentage of accident is small. No human improvement is made except at the cost of some accidents, but it seems to me that proportion here is so small as to be almost unworthy of notice. The newspapers have had so much to say though, that the public is excited.

Of course, if one of those wires strikes a person, he is a gone coon, and I don't propose to have any charges of manslaughter brought against me.

I was the witness of a curious scene the other day. I saw a Coroner trying mighty hard to get a witness on the stand to swear that the Mayor was responsible for the death of a man. He did not swear it, but the Coroner tried mighty hard to have him. The question of extending the electric light street system must be considered with reference to this point.

Commissioner Newton asked whether the new companies could not use the subways or the old wires and poles in the streets.

The Mayor said that the Corporation Counsel thought the poles and wires available to whatever company got the contract, but he was sure that such a question would have to be settled in the courts.

Gen. Newton also wanted to know if the Board of Electrical Control would not have to authorize any extension of the wires and poles. The Mayor said that the Gas Commission's award would still be subject to the Subway Commissioners superior control in that particular, and added that the Subway Board seemed to be even more apprehensive of the dangers of the wires than the newspapers.

Afterward the Mayor again declared that he was not going to vote to expose the people to the dangers that the newspapers and the Subway Commissioners dread so much. When the absence of poles and wires in Wall street was mentioned, he said:

"That street is full of brokers and rich people. The idea of putting them in danger is not to be entertained for an instant. We must take care of the rich people. We want somebody to pay the taxes."

The awards made were 441 lamps to the Brush Illuminating Company at 35 cents each per night, to the United States Electric Light Company 352 lights at 35 cents, to the East River Electric Lighting Company 433 at 35 cents, to the Ball Electric Light Company 48 at 27½ cents, to the Mount Morris Electric Light Company 85 lights at from 28 cents to 60 cents, to the Harlem Electric Light Company 49 lights at from 35 cents to 60 cents, and to the North New York Illuminating Company 50 lights at an average of 35 cents. Total number of lights, 1,344.

*** J. E. Hogan, manager of the Sunset Telephone Company, San Jose, Cal., has absconded with $1,000 belonging to the company.

Telephonic News

*** The people of the city of Utica, N. Y., are already expressive of their appreciation of the new telephone service. The connections on the toll lines have not all been made yet, but before another week Manager Nicholson expects to have the system in smooth working order.

*** Manager Beals of the telephone exchange at Rutland, Vt., has under consideration the introduction of the system of calling subscribers by numbers. The plan is to have each subscriber called by a number, and thus avoid the use of names. The change would no doubt meet with the general approval of the subscribers, as it has in all the other New England exchanges, and in fact wherever adopted. The custom is almost universal among the larger exchanges.

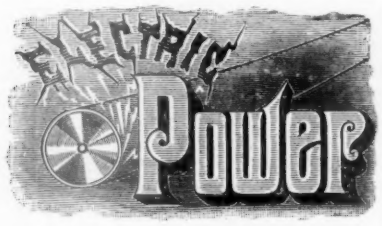
*** The Directors of the Cumberland Telephone & Telegraph Company met last week and elected officers for the year. O. F. Noel was elected president, John Lenihan, secretary, and S. A. Alexander, treasurer. The company's business was reviewed and it was shown that for the year ending March 31, 1888, the gross earnings were $188,714.42, the expenses $111,574.19, the net earnings $77,140.23. The expenses were unusually large, attributable to new switch-boards and office equipment being supplied to the exchanges at Memphis, Tenn., and Evansville, Ind., as well as to the purchase of considerable cable for the exchanges at Nashville and Memphis. It will be remembered, that about two years ago, owing to the low rates established by the legislature, the company lost its territory in Indiana and was compelled to abandon its exchanges at Evansville, Mt. Vernon, Booneville and other towns in that state, embracing about 625 subscribers. This loss has been more than recovered by the growth in its business in Tennessee, the company now accomodating a larger number of subscribers than at any period since its organization. There has been a gain of 569 subscribers in Nashville and Memphis alone.

The Use of Wires.

A practical user of wire was joking the other day on the question of wire gauges, and made the old-fashioned remark that "one half the world doesn't know how the other half lives," as applied to the wire question.

"The fact is," he said, "I see you electricians are all the while in the suds and dust about the sizes of wires. Edison, for example, has made an arbitrary gauge for his own companies' use, and your national association has a spasm twice a year on the same subject. Now, who should have the say so, in such matters? What would the electrical people say to a suggestion that they consult with the shoemakers and manufacturers of corsets and garters, in this matter? You wouldn't think these parties ever handled much wire, would you? The fact is," he continued, "this wire business is much like the lumber trade. In a little town up in Wisconsin, I saw not long ago, several thousand feet of hard wood logs, and was told that they were all to be split up into tooth-picks. A lumber man who runs a very large yard told me the other day that he sold every inch of his stock of best pine one day to be made into matches.

"There is one garter man who buys tons of small brass wire at a time, and one shoe firm that I know of that orders 150 tons at a swoop, for pegs, and the dear only knows how much the coiled spring corset men must have to run their business. No. The electric light men don't use much wire compared with the shoemaker and women's goods manufacturers. Even the locksmiths use miles to your yards for lock springs alone, and the bell hangers, knitting and sewing needles, pin——" There is no knowing where he would have stopped, had not an unconditional surrender been tendered by an electric light man who was listening, and the meeting adjourned.



There are four and a half miles of electric road in operation at San Diego, Cal., half a mile in construction, and eighteen and a half miles projected.

The San Bernardino and Colton (Cal.) Electric Railway Company has been incorporated, to build a road from Colton to the California Central depot in San Bernardino.

The Carbondale, Pa., *Leader* is greatly pleased with the Mather electric light and electric motor that illuminates and furnishes power for that office. The citizens are invited to call and see the motor do its work.

Mr. Lufkin, of the C. & C. Motor Company has just returned from a very successful trip to New Orleans. This company has enlarged its factory, and is now turning out motors of all sizes from one-eighth to twenty-five horse power.

Under the date of May 17th, Mr. F. B. Thurber, of the wholesale grocery house of Thurber, Wyland & Co., says that the elevator service recently installed in their place by "the Sprague Electric Railway and Motor Company is the best and cheapest in the world." He is evidently pleased.

Mr. Edward E. Higgins, formerly of the Standard Electric Co., Vt., has accepted a position with the Sprague Co., as managing agent for western New York, with headquarters at Buffalo. This is a good acquisition of the Sprague Co., as Mr. Higgin's ability and energy stands very high.

Sprague Electric Railway and Motor Co. report business as excellent, and constantly on the increase, with very large sales of Standard Motors, and in addition, they have closed contracts for the equipment of railway at Steubenville, Ohio, also the Naumkear Road at Salem, Mass., and have several others ready to be closed up.

A. H. Emery, agent for the Julien system of electric motor roads, has been in Fresno, Cal., the past week, on business connected with the proposed electric road. He estimates the cost of the four miles of road at $50,000. An extension of sixty days on the franchise has been granted, and before the expiration of that time the road will either be begun, or the project given up.

In calico printing works it is customary to supply each printing machine with a separate engine to drive it. One reason for this arrangement is that every time a fresh pattern is put into the machine it requires to be driven with exceeding slowness, and is frequently stopped until the attendant has adjusted all the rollers so that the various parts of the pattern fall exactly in the right place. The electricians have not been slow to appreciate the complication of a number of engines, supply and exhaust pipes, and at the late Manchester exhibition there was shown a cotton printing machine driven by an electric motor. This was planned to run at 700 revolutions per minute, but was reduced in the proportion of 56 to 1 before affecting the machine. Where there are a number of printing machines one large engine and dynamo might suffice for running a number of motors and a considerable economy be affected.

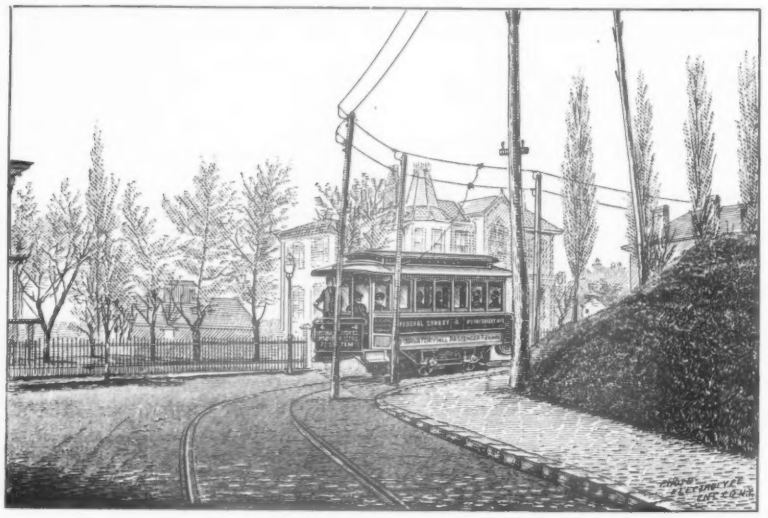
Mr. Gilbert M. Smith has been appointed manager of the Chicago office of the Ansonia Brass & Copper Co., at 64 Washington street.

The Board of Directors of the New York State Fair, at their last meeting, at Syracuse, appointed a committee from among their number to attend and inspect the International Exposition, to be held at Buffalo, N. Y., on September 4th to 14th. This promises to be a very interesting and complete exhibition, in which electrical machinery will play an important part.

A Letter from Southern California.

The Ft. Wayne Jenney Electric Company of San Diego, which by means of eight electric masts of six lamps each, dispels darkness in that thriving metropolis of the extreme southwest, recently took offence at an action of the Common Council of that city and now runs the lamps strictly according to almanac schedule. The contract between the company and the city, stipulates that the lights shall be burned only when the moon is not shining, and to determine whether that luminant shines or not, the almanac is relied upon. It frequently occurs during the winter and spring months, owing to the cloudy weather which prevails at night, that the moon shines only in theory, and on such nights it has hitherto been the policy of the company to burn the lamps. Recently, however, complaint was made to the Council that only four lamps were being burned on each mast and consequently, the city Dads threatened to cut down the company's pay two-thirds. At this the company took offence and now is running the lamps according to almanac, and as a result the city is part of the time in darkness. Right seems to be on the side of the company; nevertheless, no little kicking prevails at what appears to be unjust exaction on the part of the electrical people.

The material for the ninth electric light mast for the city has arrived and the mast will be placed in position during the present week.



View of Electric Car on a Turn of the Observatory Hill Railway, Allegheny.

J. C. Herderson, superintendent and manager of the Electrical Construction Company of San Francisco, representing the Edison interests in California, was in San Diego during the past week, and has been endeavoring, with some success, to form a central incandescent station to furnish merchants lights within a radius of one mile of the center of town. The Edison people already have a plant in the Pierce-Morse block in this city. It is a magnificent five story building that is lighted throughout with the Edison 16 candle power lamps. There are in the building 250 lamps, and the plant is furnishing 250 additional merchant lamps. The plant consists of two 250 lamp Edison dynamos, each run by a 35 horse power Westinghouse engine. Power for the engines is furnished from two 50 horse power boilers, built by James Begg, of New York. The current for merchant lighting is carried in underground conduits, and the entire system is giving the greatest satisfaction. It is the Pierce-Morse people that Mr. Henderson hopes to interest sufficiently to form the central station, and although negotiations are not yet completed, it is not expected that the project will fall through. G. P.

San Diego, Cal., May 28.

Manufacturing Notes.

Chas. A. Schieren & Co. report recent sales of their Electric Leather Belting to the following concerns for use on dynamos: Phoenixville Electric Light Co., Phoenixville, Pa.; Thomson-Houston Electric Light Co., Orange, Mass.; J. J. Robbins, Scranton, Pa.; Hempstead Gas Light Co., Hempstead, L. I.; Jenney Electric Light and Power Co., Logansport, Ind.; Plainfield Electric Light Co., Plainfield, N. J.; Richfield Springs Electric Light and Power Co., Richfield Springs, N. Y.; Richmond Light, Heat and Power Co., 145 Broadway, city; Deland & Co., Fairport, N. Y.

The Faraday Carbon Company has been obliged to increase its already very commodious factory facilities. The manufacture of a good standard article never deviating in quality, always results in good returns and increased business.

The Boston Electric Club will be one year old June 21. It proposes to celebrate its first birthday in a fitting manner. The entertainment will consist of the reading of papers followed by a dinner and a social time.

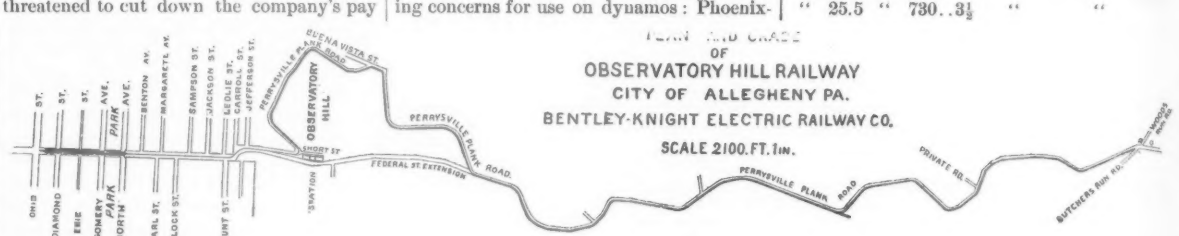
Table of Grades on Observatory Hill Passenger Railway.

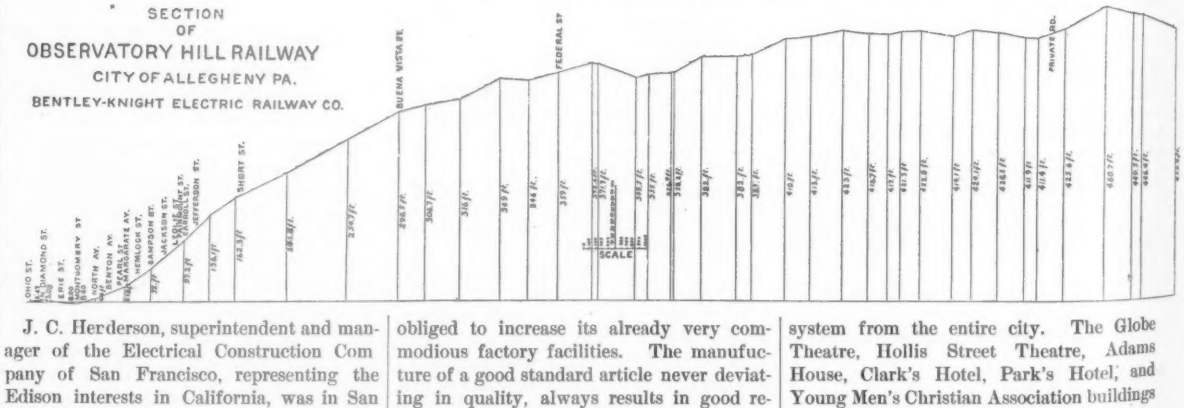
CONDUIT.

Rise 3	feet in	200.. $1\frac{1}{2}$	per cent.	up grade.
" 0	"	60..0	"	level.
Fall $3\frac{1}{2}$	"	500.. $\frac{7}{10}$	"	down grade.
" 0	"	65..0	"	level.
Rise 5	"	250..2	"	up grade.
" 19	"	470..4	"	up grade.
" 28.2	"	400..7	"	up grade.
" 45.2	"	495.. $9\frac{1}{8}$	"	up grade.

OVERHEAD.

Rise 38.9	ft. in	400.. $9\frac{3}{10}$	per cent.	up grade.
" 26.2	"	395.. $6\frac{5}{8}$	"	"
" 39.2	"	800.. $4\frac{7}{8}$	"	"
" 53.2	"	930.. $5\frac{3}{5}$	"	"
" 41.8	"	800.. $5\frac{1}{4}$	"	"
" 10.2	"	415.. $2\frac{7}{16}$	"	"
" 9.3	"	540.. $1\frac{3}{5}$	"	"
" 33	"	615.. $5\frac{3}{5}$	"	"
Fall 3	"	440.. $\frac{3}{4}$	"	down grade.
Rise 13	"	470.. $2\frac{3}{4}$	"	up grade.
" 13.6	"	510.. $2\frac{3}{5}$	"	"
Fall .7	"	90.. $\frac{7}{9}$	"	down grade.
" 22.4	"	590.. $3\frac{9}{11}$	"	"
Rise 5.5	"	200.. $2\frac{3}{4}$	"	up grade.
" 1.9	"	350.. $\frac{4}{7}$	"	"
" 1.3	"	50.. $2\frac{3}{5}$	"	"
" 23.8	"	410.. $5\frac{5}{7}$	"	"
" 0	"	545..0	"	level.
" 3	"	240.. $1\frac{1}{4}$	"	up grade.
" 25	"	515.. $4\frac{9}{10}$	"	"
" 3	"	380.. $\frac{3}{4}$	"	"
" 10	"	500..2	"	"
Fall 4.3	"	400.. $1\frac{1}{13}$	"	down grade.
" 1.7	"	300.. $\frac{3}{5}$	"	"
Rise 4.3	"	200.. $2\frac{1}{2}$	"	up grade.
" 1.5	"	300.. $\frac{1}{2}$	"	"
Fall 8.7	"	500.. $1\frac{4}{5}$	"	down grade.
Rise 10	"	300.. $3\frac{1}{3}$	"	up grade.
Fall 3.9	"	400..1	"	down grade.
" 8.3	"	400.. $2\frac{1}{15}$	"	"
" .5	"	200.. $\frac{1}{4}$	"	"
Rise 14.2	"	400.. $3\frac{1}{2}$	"	up grade.
" 35.1	"	650.. $5\frac{6}{7}$	"	"
Fall 11.2	"	450.. $2\frac{1}{2}$	"	down grade.
" 3.1	"	170.. $1\frac{7}{9}$	"	"
" 25.5	"	730.. $3\frac{1}{2}$	"	"





The Edison Electric Light Station in Boston Burned.

The building in Head place, in which was situated the Edison electric light plant, took fire at an early hour Friday morning, June 1st. The firemen soon had the fire under control, but not until the entire upper portion of the Edison works was completely destroyed. The second floor was used as the dynamo room, and here the fire started. Several employés had narrow escapes. The burning of the station cuts out the Edison system from the entire city. The Globe Theatre, Hollis Street Theatre, Adams House, Clark's Hotel, Park's Hotel, and Young Men's Christian Association buildings were lighted from this source.

Messrs. Hyer & Montgomery have just received an order from Mr. R. B. Buckley for a 125-light Heisler machine, to light his summer residence and grounds at Rhinebeck, N. Y. Water power will be used.

A Singular Confirmation of the Tesla Theory of Alternating Current Motors.

Nothing is so strongly suggestive of the mysterious workings of the human intellect as the oft recurring fact of the independent discovery of a new scientific principle by two men in different parts of the world, and generally unknown to each other. And in no field has this fact of independent discovery been as apparent as in that of electrical science. We have now another instance to record. Right on the heels of the recent publication of Tesla's very interesting alternating current motor, comes the announcement, in London *Industries*, of a similar discovery by Prof. Galileo Ferraris, of Turin, of which we append a brief abstract:

The principle on which the apparatus is based is exceedingly simple, and will be understood by reference to the accompanying

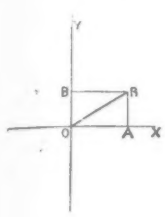


FIG. 1.

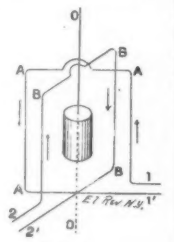


FIG. 2.

sketches. Let in Fig. 1 the lines *O A* and *O B* represent in direction and magnitude the strength of two magnetic fields. The combined action of these fields on a unit pole, placed in the point *O*, would then be represented by the resultant *O R*. Instead of having two distinct fields, we have one resultant field, represented in direction and magnitude by this line. If both fields undergo periodic variations of the same period, the resultant field *O R* will also undergo a periodic variation, and the point *R* will traverse a curve, the form of which depends upon the precise manner in which the lines *O A* and *O B* change with the time. The fields *O A* and *O B* can be produced by two coils, having the lines *O X* and *O Y* respectively for their axes, and which coils are traversed by alternating currents of the same period. If the alternating currents may be expressed as sine functions of the time, and if there is an appreciable lag between the currents in the two coils, the point *R* describes an ellipse round *O* as center. In this case line *O R*, representing the resultant field, revolves round the center, *O*, the direction and magnitude of the resultant field changing at every instant. If, however, there is no lag between the two currents, that is to say, if they pass through zero simultaneously, the direction of the resultant field, *O R*, remains stationary, and the point *R* performs harmonic oscillation over the line *R O* and its prolongation with *O* as center. This may be considered as a special case of the ellipse where the latter has been flattened down to a mathematical line. Another special case occurs when the ellipse becomes a circle, and this must evidently take place when the lag between the two currents is 90°, when the coils are at right angles to each other, and when the component fields are equally strong. A metallic body suspended in the center of the two fields, and free to revolve, must evidently have a tendency to participate in the rotation of the resultant field.

The application of this very simple principle will be clear from Fig. 2, in which the two coils are indicated by the rectectangles *A* and *B*, the connections being made by the the wires 1' and 2' respectively. When alternating currents are sent through these coils a resultant field is produced, which revolves round the line *OO*. In the center, between the coils, is suspended a small hollow cylinder of copper, and as the lines of the resultant field cut the metal Foucault currents are induced, and by the interaction of these induced currents and the revolving field the cylinder is set in rotation. The action is exactly the reverse of that occurring in the well-known experiment in which a copper disc is rapidly revolved below a compass needle, with the result that the compass needle is deflected on account of the induced currents in the copper disc, and ultimately caused to rotate with the copper disc.

Up to the present we have spoken of two distinct currents being required in the coils *A* and *B*, one lagging behind the other by a quarter period; and to perform the experiment we might employ an alternating current dynamo with two circuits in the armature, so arranged with regard to each other as to produce the desired lag. It is, however, possible to perform the experiment by using an ordinary alternating current machine with only one circuit on the armature, and to produce the second current by means of a transformer.

In the first experiment made by Professor Ferraris, a Gaulard & Gibbs transformer, with an equal number of turns in the primary and secondary coils, was used. In the primary circuit was included the coil *A*, consisting of a few turns of stout wire, whilst in the secondary circuit were included an adjustable and non-inductive resistance and the coil *B*, the latter consisting of many turns of fine wire. A small hollow copper cylinder was suspended on a thread in the center of the two coils, as shown in Fig. 2. If the current was sent through only one of the coils, the cylinder remained at rest; but if currents were sent through both coils, the cylinder immediately started to revolve, twisting the thread on which it was suspended. A reversing switch was inserted in the secondary circuit, and if the current through this circuit was inverted, the cylinder was immediately brought to rest, and started in the opposite direction. Professor Ferraris next substituted a small iron cylinder for the copper one, and found equal results; but when using an iron cylinder sufficiently large to nearly fill the place within the coils, the experiment did not succeed so well. He attributes this to the greater self-induction which the presence of iron in a large mass necessarily introduces into both circuits. Another experiment was made with a small iron cylinder, composed of a number of thin discs insulated from each other, and this experiment also succeeded. Foucault currents could not in this case be the cause of rotation, and Professor Ferraris thinks that the rotation is due to hysteresis. A large apparatus was then constructed which is indicated in our sketch, Fig. 3. In this case, the copper cylinder, which was mounted upon a horizontal axis in bearing, had a diameter of 3½ inches, and was 7 inches long, its weight being 11 pounds. This cylinder was closely surrounded by the primary and secondary coils wound upon wooden bobbins. To make room for the

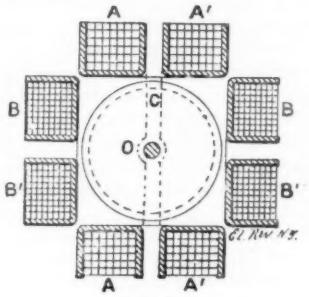


FIG. 3.

shaft each coil was in halves, the primary consisting of 96 turns of 77 mils. wire, both coupled in series, so as to produce the effect of a coil of 192 turns; the secondary consisting of 504 turns of 38 mils. wire, both being coupled in parallel, so as to produce the effect of 504 turns. The resistance of the primary coils was 7.12 and 6.63 ohms respectively, and that of the two secondary coils coupled in parallel was 3.43 ohms. In the secondary circuit was also inserted a rheostat without self induction, and the best results were obtained when the rheostat was set to between 15 and 18 ohms. A Gaulard & Gibbs transformer was used, giving 80 reversals per second. The copper cylinder began to revolve when the primary current was 5 amperes, and with higher currents the velocity could be increased to 900 revolutions per minute, and might have been still further increased but for the somewhat imperfect mechanical arrangements, which occasioned considerable vibrations. To the shaft was applied a small friction dynamometer, and the following table gives the work obtained on the brake by a primary current of 9 amperes at different speeds:

Revolutions per minute:	262	400	546	653	722	770	772	900
Watts obtained on brake:	1.32	2.12	2.65	2.77	2.55	2.40	2.04	0

The maximum energy was obtained at 650 revolutions. Beyond that speed the energy decreased, which is attributed by Professor Ferraris to the imperfect mechanical arrangement of the apparatus, causing a considerable waste of power in vibrations. If it were not for this, the maximum energy would have been obtained at about 1,200 revolutions, whilst at 2,400 revolutions, which is the speed of the revolving resultant field, no energy at all could be obtained. Professor Ferraris suggests that this apparatus may be used for lecture purposes, and as a motor when the power required is small, and it may also be used as an electricity meter. The torque exerted by the revolving field upon the copper cylinder is proportional to the square of the current, and in order that the total number of revolutions performed in a given time may be an indication of the number of coulombs supplied, it is necessary to introduce some opposing force which varies with the square of the velocity. If this can be done, and if the friction of the journals can be sufficiently reduced, an ordinary counter attached to the axis would indicate the quantity of electricity supplied.

Mr. Tesla has produced a practical motor, while Prof. Ferraris has made only a lecture apparatus of no commercial value. The substantial honors belong to Mr. Tesla.

Electric Light Work in Fall River, Mass.

The Fall River Electric Light Company has purchased the land next south of the site occupied by the Edison Company on Hartwell street, and will erect thereon a commodious station capable of supplying the requirements of the business for many years. The lot has a front of 51 feet, and is 146 feet deep. Plans have been prepared for a building to occupy nearly all of this lot. When the company started, four years ago, it was with the idea of putting in a plant with the capacity of 200 lights, believing that this limit would not be recorded for many years. It is now running 197 arc lights, and the capacity of its present station will soon be outgrown.

The Edison Company are making rapid progress in recovering from the effects of the recent fire. They are running all their lights from the old station now, although repairs have not yet been completed, and it will take a few weeks longer to get everything finished. When the work is completed the company will have an entirely new equipment of dynamos of the latest construction, larger and better than the old, and the station will really be better equipped than before. The management has shown great energy in overcoming the difficulties caused by the fire, and is now giving excellent service with its temporary fixtures, says the *News* of that city, which will be still further improved when the work is completed.

Electric Light in Montana.

H. M. Ogden, the electric light man of Ogden City, Utah, has returned to Missoula to make final arrangements for installing an electric plant of the Thomson-Houston system, under the franchise granted by the city last fall. Mr. J. A. Tupper, of the electric light company of Butte, has succeeded to the interest of Mr. Heyman, and will have charge of the installation. Active operations will begin about the 15th inst., at which time Mr. Tupper will arrive. Mr. Ogden is prepared to push the scheme to a finish, and proposes to give the citizens of Missoula a chance to light their residences, as well as their business places, with a light superior to anything in the western country, and at rates as cheap as the cheapest. It is to be hoped that the city will encourage the enterprise by ordering a number of street lights put in position at as early a date as possible. Nothing creates an impression of prosperity like a well lighted city.—*Missoula Gazette.*

—— The new electric light works in Santa Cruz, Cal., are in running order.

—— The Electric Illuminating Company, of Denver, Col., has been granted a franchise.

—— J. C. Chilton, Detroit, Mich., will establish an electric light plant at Zanesville, Ohio.

—— The Santa Rosa, Cal., Trustees have passed an ordinance to call for bids for lighting the streets.

—— Efforts are being made to organize a company to erect an electric light plant at Meridian, Miss.

—— The Sheffield Electric Light Company, of Sheffield, Ala., have made a proposition to light Tuscumbia.

—— An electric light plant will, it is said, be erected soon in Camden, Ala. The city clerk will give information.

—— One William Gore was hanged for murder in Columbus, Ohio, at 1.15 A. M., the gallows being lighted up by the arc light.

—— The electric light has been introduced into elevators 1, 2 and 3 at West Superior, Wis., with excellent results as to safety and convenience.

—— The Hartford Light and Power Company have commenced putting in wires in private residences, which are to be lighted with electricity hereafter. From a dozen to fifteen residences will be lighted with electricity within a month.

ELECTRIC LIGHT NEWS

—— The Rome (Ga.) Gas Light Company will erect an electric light plant, and have commenced work. Will use the Thomson-Houston system.

—— The Annapolis Electric Light Company expect to purchase the necessary material, etc., at once, to proceed with establishing a plant here.

—— The Heisler Electric Company, of St. Louis, has an order for 600 lights of thirty candle-power, for the illumination of the main fronts of the Exposition Hall.

—— The Newburyport Electric Light and Power Company of Newburyport, Mass., have elected Wm. R. Johnson president, and will soon increase their capital stock from $30,000 to $45,000.

—— The Providence, R. I., Council adopted the resolution authorizing the committee on lamps to contract for 175 arc lamps, by a vote of 39 to 1. The committee is expected to advertise for bids.

—— The Santa Barbara Gas Co., Cal., has bought the stock of the Electric Light Co., and the two concerns run together. The plant will be increased. J. P. Redington has been elected president of the Light Co.

—— The Georgia Electric Light Company, at Atlanta, Ga., is to erect a new brick station, 110x60 feet, two stories high, adding a new 120 horse-power boiler and 100 horse power Hess automatic engine, thus increasing its capacity to 350 arc lights and 800 incandescents.

—— An electric light manufacturing Co. is being formed at Chico, Cal., to run the plant at that city and to manufacture plants for other places on the coast. Capital stock, $100,000. Directors, Jesse Anthony, Jas. Anthony, Dr. A. McFadyen, B. C. Trefry, Wm. H. Schooler.

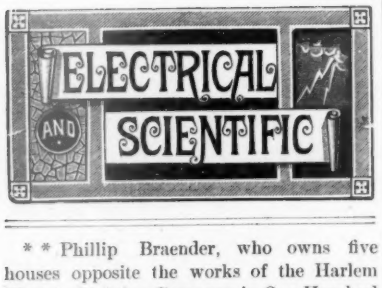
—— The work of placing poles and stringing wires by the electric light company of Madison, Wis., has begun. Fifty arc lights have been subscribed for by the merchants and business men, and the lights are being put in generally. To start with, a fifty-light dynamo will be used, and an eighty horse-power engine.

—— A company is about to start electric works on Deer Creek, below Nevada City, Cal. Water power, of which there is an abundant supply, will be used and will be sent to such mines in Grass Valley and around Nevada City as are not within reach of water power. Several mining companies here agree to take the power.

—— James Fuller is in British Columbia as agent for the Edison incandescent electric light. He has recently put up a 450 light plant at the Bauff hotel; a 120 light plant for the Keewatin Milling Co., and a 250 light plant in the C. P. R. hotel at Vancouver. He is putting in a 100 light plant in the dry dock at Victoria. It will be run by an Armington & Sims engine.

—— The location of the city electric light station at Greenville, S. C., has been fixed. The contract for building the necessary works will be given at once, and measurements for putting in the lighting plant will be made. In a short canvass of business houses orders were taken for over 300 incandescent lights to be furnished by the city's incandescent plant, which will be put in as soon as the arc plant is completed.

—— At a meeting of the board of directors of the Waterhouse Electric Company, of Baltimore, held last week, the resignation of Mr. Robert R. Zell as vice-president and general manager of the company was accepted, and Mr. F. G. Waterhouse was elected to fill the vacancy. Messrs. H. G. Fledderman and H. T. Biedler were also elected directors to fill the vacancies caused by the resignation of Messrs. Zell and Pope from the board.



* * Phillip Braender, who owns five houses opposite the works of the Harlem Electric Lighting Company in One Hundred and Twenty-second street, near Second avenue, New York, began a suit for $50,000 damages against the company. He claims that the place is a nuisance and that the working of the machinery shakes the houses. Probably he thinks the works should go underground.

* * If Mr. Edison's phonograph really does what the inventor claims for it, one of the most amiable and useful specimens of humanity, one of the choicest ornaments of society, the musical critic, will gradually disappear. The time will come when, after the performance of a concert or opera, the phonograph will be taken to the editorial rooms, and there the night editor will set the machine a-going, and, with the assistance of the sporting editor, the Police Court and Produce Exchange reporters, criticise the merits of a Wagner music-drama, a new pianoforte concerto by Rubinstein, and the performances of a virtuoso, or a new prima donna.—*Music and Drama.*

* * There is a general belief among the uninitiated that all good engineers are practical machinists. This belief is entirely erroneous, for the rule has always been that the best engineers come up from the ranks of the firemen, and not from the machine shops. While an engineer of experience can repair a break in the machinery of his charge, he could not build a locomotive, or any part of it at all intricate in construction. Instances can be cited where machinists have totally lacked the nerve, gained by long experience, to run an express train at the high rate of speed necessary to make schedule time, and in the majority of cases where a man is taken from the shops and placed on a locomotive he makes a better freight engine driver than when put in charge of a passenger. I once knew a popular engineer, says a correspondent of the *Globe-Democrat*, who had worked in the machine shops until into middle life, and had then been given a desirable run on the limited express. His train was always behind time, and in a few months he looked terribly aged. One day he threw up his job, and none too soon, for he would inevitably have lost the place anyway, and he afterward told me that he lacked the nerve to pull the throttle out and give her the full headway needed to make the time on his run. He said that when running at a rapid rate, he felt like a man gazing downward from a dizzy height, and nothing could induce him to step within the cab again. He went back to the shops. There are exceptions, of course, but they are few and far between.

Magnetism in Watches.

BY THEO. GRIBI.

An article which is going the rounds of the periodical press under the above caption from the pen of Mr. C. K. Giles, merits a review. We are heartily glad that Mr. Giles has introduced this subject to public discussion. It is an important one, engrossing at present the thoughts alike of consumers and manufacturers of watches, and is likely to become the focus of a complete revolution in the shops of the latter.

We are willing to accord Mr. G. considerable credit for his manner of treating the subject. He has evidently given the matter much thought, has ventured on new paths which no one before him had trod, and, we think, no one after him will tread. But the article, purporting as it does, to be a paper read before the Electric Club of Chicago, is plainly a shrewd argument in favor of the so-called "Anti-Magnetic Shield," an invention of his, and as such, is open to criticism. It is truly wonderful how Mr. G. succeeds, or thinks he does, in subduing the dreadful enemy "magnetism," and making of it not only an "obedient servant," but a "friend" and "an ever present help in trouble;" but we are afraid that this is more beautiful in theory than true in fact.

We do not intend to follow him through all his elaborate speculations on the nature of magnetism; nor are we, to confess the truth, prepared to deny anything which he has advanced that is new. Indeed, we should not care to do so were there ever so much to say against it, our interest being wholly in the facts and phenomena of magnetism in watches with which we are well acquainted, and in the means of protecting them against it. But it may be well to observe that his theory of the nature of magnetism is wholly founded on the theory of the atomic or molecular constitution of matter and with it will stand or fall. Now, we have no hesitancy in saying that the molecular theory of matter is a mere figure of speech, a means to assist in the attempt of making some theory as touching the nature of phenomenon comprehensible, and that it lies wholly in the domain of speculative philosophy. In fact, we may without fear of contradiction, go further and assert that it is positively unthinkable; for there is no limit in our conception, for the sub-division of matter. An atom, however small, must have dimensions, and its sub-division is still thinkable until the vanishing point is reached, where matter ceases to be recognized as such and passes over into force, and where molecules are no more thinkable. But Mr. G.'s argument as touching the subject in hand, though ingenious, is deceptive. We should infer that he thinks even a non-magnetic watch would go better by putting it into a shield. If we did not see the true reason he had for using such an expression as that "a watch made of non-magnetic material is an emasculated time-keeper," we should say that he has never yet grasped the meaning of the expression "non-magnetic"; nay, worse than that, that he does not fully comprehend his own statements concerning the nature and phenomenon of magnetism. According to his teaching, magnetism exists as a "dual force," and in "a state of satisfied polarity" in all matter. He considers this the "normal condition" of matter, and that when this normal condition of polarity is disturbed "we get the phenomena of magnetic and electrical effect." But in the case of the non-magnetic balance we have no such effect, *i. e.*, we have no proof of the disturbance of polarity. How does he know that it exists there? We call a balance non-magnetic because we observe none of the effects of magnetism exhibited in it, such as are manifest in balances made of substances called magnetic, and we are warranted in drawing the conclusion that its movements, when in the watch, will suffer none of the bad effects attributable to magnetism. If, instead of iron filings to illustrate the "lines of force," as he calls them, around a pair of horseshoe magnets we substitute filings of brass, we observe no such arrangement of them around the poles, no "*lines of force.*" Why not?

Mr. G.'s illustration of the magnetic lines formed around the poles of a pair of magnets with a shield between them, practices a little deception on the reader's mind, unless he be better informed, in that it leads him to conclude that the magnetic force does not penetrate into the interior of the shield, there being no filings within that space. This is a mistake, as may easily be proved by placing a small magnetic needle within the shield, when it will be observed to respond immediately to the effect of the magnets without. If the space on the cardboard within the shield is also covered with iron filings, they will immediately arrange themselves in curved lines from pole to pole, the same as the outside ones. It is true that filings placed within the shield itself when the poles of the magnets are in contact with it, are comparatively uninfluenced by the magnetic force, and fall about in the shield freely; but this is not owing to any anti-magnetic virtue in the shield proper, as the reader might be led to think, but to the fact that the contact of the shield with the magnets closes the magnetic field of each, and leaves the space between them comparatively neutral. The same effect may be produced by using an ordinary tin movement box, or a shell of magnetic metal of any kind and shape enclosing a space. Indeed, without the use of a shield, if we close the magnetic field of the magnets by placing a piece of steel over the poles, thus connecting them, a third piece of steel laid in the space between the two magnets when in juxtaposition, is neither repelled nor attracted by either. Of course we understand that Mr. Giles bases his claims of the anti-magnetic qualities of the shield upon this very fact. By surrounding the watch movement with a shield of "highly magnetic metal," he places it within this neutral ground, and the reader is invited to think that he thus protects it from the influence of magnetism, or if he cannot be induced to think so, he commands other resources by which he invites him to believe the realization of the still more difficult solution of the problem of making magnetism subservient as a means of more accurately regulating a watch than by any other means. We know not the possibilities which human engineering has in store in the utilization of nature's unemployed and now mischievous forces. The cyclone may yet be harnessed to the plough. But we must be excused if our conscientious scruples hold our judgment in abeyance pending the production of more solid proof. We have given this matter some serious thought, impelled by a love for the truth. We would welcome it in any shape, even in the "multipole balance." But we feel so badly when we are disappointed that we have become cautious in the acceptation of anything, though it may be backed by the recommendations of powerful corporations.

We have already drawn attention to the fact that this so-called neutral space within the shield is not wholly neutral, that iron filings, when properly strewn inside the shield will form into lines of force the same as those outside of it, that the compass needle, when placed within the shield, will immediately respond to the magnetic force on the approach of a magnet. If furthermore, we submerge the shield in a shallow dish of water so as to fill it half full and then float a steel balance inside of it, it will be seen to be immediately attracted on approaching with a magnet. Yet Mr. G. claims that "his closed magnetic circuit or shield circle remains the same and is uninfluenced," (see page 30, Fig. 3 and col. 2, bottom.) If, however, instead of a steel balance, we float a non-magnetic one, it will remain perfectly indifferent to the influence of the most powerful magnet, and that whether we float the balance inside or outside of the shield. Which of the two does the reader think would stand proof against magnetic influences in a watch?

When we see watch movements in anti-magnetic shields running on the poles of magnets in show windows without stopping, we are silently asked to concede that they are not influenced by magnetism. Does Mr. G. ever observe their daily rate, and will he tell us what it is?

Some people, other than "the heathen Chinese, for ways that are dark and tricks that are vain" are "peculiar." They have a way of telling us one-half the truth only, sometimes not even that much, and to their shame must it be said that it is generally that half which furthers self-interest only, if it does not always reflect discredit on their neighbors'!

Of this species of truth-telling is a familiar advertisement recently circulated in trade journals by a great and prosperous concern. On the one side this much respected corporation makes the statement that "most of the watches manufactured in Geneva, and represented as non-magnetic, have not been such; but could be stopped by strong magnetic influences." and here it leaves them. On the next page it revindicales its own non-magnetic ware, and says that "although they can be temporarily stopped if brought into actual contact with dynamos, etc., yet their time-keeping qualities will not be thereby affected, and when withdrawn from contact with such forces, they will run as well as before. For the *information* (the italics are ours) of those who have not made the test," we will here add the other half (or two-thirds?) of the truth, and state that the Geneva non-magnetic watches *will not stop* when laid on the most powerful dynamo, and if some of them do—for reasons well known to, but not stated by, the esteemed authors of the above advertisement—they, too, are not affected in their rate after being removed from contact with such forces. Of the same nature of truth-telling, though of a much milder form, is the exhibition of watches running in shields on the poles of magnets. The fact that a watch does not stop under such conditions is no proof that its rate is not disturbed. We happen to have the liveliest conviction of this from personal experience. We have made a test of four movements running in what he calls "reinforced shields," lent to us by Mr. Giles himself for that express purpose, of the results of which we have furnished him a true copy. It is not our purpose to give a detailed account of this experiment now, desiring to make some further trials ere we submit an analysis, but we may say that, while not running as badly as a watch with steel balance without a shield, they do not stand the test when running on the poles of six-inch magnets, their rate varying considerably when changing the orientation. But it is proper to state, however, that Mr. Giles never claimed to us that watches running in his shields would not suffer variations in their rate when directly exposed to the influence of magnetism, nor that they would not stop when placed on a dynamo, which they all do without exception. What he does claim is, that they are protected against the ordinary atmospheric currents (?) of magnetism to which watches are exposed when being carried. Of what moment the danger from this source really is, perhaps Mr. G. alone can inform us. He seems to think that these magnetic and electric influences are universal, and it may be so to some extent; but we would observe that it has not yet been demonstrated that watches become magnetized except when brought within the magnetic field of an electro dynamo or powerful magnet, nor that any variation in their rate, while under the ordinary wearing conditions, is due to magnetic influences, except when they have previously been magnetized. It therefore follows that, so far, this danger is only hypothetical, and it alone is that "ordinary outside magnetic condition" which Mr. G. claims will not unbalance the lines of force in which his watch escapement vibrates (see page 31, col. 1, line 15 from top). But we must really insist that the reader will commit to memory the whole paragraph in which this quotation occurs, beginning on page 30, line 2, bottom, "a watch movement placed within," etc. The boldness of the statements Mr. Giles here makes is something marvellous, and the degree to which he has succeeded in the cultivation of the imagination is exemplified in lines: "And further, the vibrations of the balance wheel are controlled, to a certain extent, by the lines of *inter-etheric polarity* (the italics are ours) which exist in the medium within the circle and is the *steadying power or governor to rate the watch against*" (the italics are ours). But the giddy height of the climax comes in the "residual force *thus created*" as a "*tangible controllable influence*" (the italics are ours). This is astonishing information of the marvels of which there is no end. We have no disposition to jest on this matter, but the thought involuntarily comes to us that what we shall hear from Mr. G. next is that he has bottled and labled it, "*patent applied for.*" We confess our inability to follow him, though our powers of perception do not forsake us. We are in the position of Archimedes when he said "he could move the world if he had a fulcrum to rest his lever against." But it is all very interesting, and we would ask the reader to study it carefully, as well as the whole of the rest of the article, while we touch on one more point which we feel we understand better.

It is a coarse, perhaps, but powerful argu-

ment in favor of the non-magnetic qualities of a watch, when it does not stop nor show any diminution in the arcs of vibration of the balance when laid on a powerful electro-dynamo in action, though that, as we have already said; does not prove that its rate is not affected thereby, it only furnishes a strong presumption. But we have tested this matter carefully. Along with the watches in shields we have tested also such as are claimed to be non-magnetic, subject to the same conditions. Those whose escapements are wholly made of non-magnetic materials do not show any variation in their rate, such as could be clearly attributed to the influence of magnetism, from contact with magnets, nor when changing their orientation; while such as have steel escapements do vary slightly. But we have made this further test of the latter: We have placed them on a powerful dynamo to stop them purposely, and thoroughly charge them, and then, without any change, have continued to observe their running after removing them, and we have found that the effect of stopping them did in no way alter their rate, this being just the same and as regular as before. It therefore follows that however the steel in a watch may be charged with magnetism, provided the balance, hair-spring and, perhaps, the table rollers, are made of non-magnetic material, it does not affect the running of it. Will this be the case with a watch in an anti-magnetic shield with steel balance, etc.?

There is a lesson in this which is of great value but which we cannot follow at present, reaching as it does beyond the subject in hand. But we hope at some future time to bring it out.

Mr. G. acquaints us with a fact which, if we have not been fully possessed of, we have long been suspicious about, and that is that a watch once magnetized can never be wholly demagnetized. This, if correct, is a powerful argument in favor of non-magnetic watches. Contrary to the pretentions which others make, as to the case with which they can demagnetize, we are free to confess that we have great difficulty to accomplish it perfectly; some portions of the watch will remain slightly affected. Moreover, when we have thought that we had fully succeeded, the needle showing no more deflection on approach of it to the watch, there came a day when it again indicated slight affinity. We would be obliged to any one for a description of a method which they have found to give satisfactory results.

We desire to pass one more criticism on Mr. Giles' article. On page 32, col. 1, he speaks of the steel compensation balance, which he says "has so nearly reached perfection, and which has been found to be the only compensation that will stand the test of time and hold its shape in a wide range of temperature. Substitutes for this steel compensation balance which have been tested by both government's and individual expert horologists within the past ten years, have met with but indifferent success, and have been abandoned and rejected. Any immunity from magnetism obtained by non-magnetic material is at the sacrifice of the permanent accuracy of the watch when subjected to the wide range of temperature of our climate."

Not to question the accuracy of this statement, though we have never seen any account of such tests in spite of our endeavors to acquaint ourselves with everything of importance to our business, we would say to Mr. Giles that he is behind the times. The Paillard non-magnetic balance, though long ago on the road of experimental research, has not been put upon the market until within a year or two, at least I am not aware that any private or government tests have been made on it before, except by the inventor. As for the Palladium hair spring—a material forming the principal constituent of the Paillard balance—it has, to my certain knowledge, been in use for the past fifteen years, and the French government, if I am not mistaken, gives preference in its purchases for the navy to chronometers sprung with Palladium springs. Competitive trials, moreover, are being made annually in many of the European observatories, notably in Geneva, Neuchatel and Kew, in which both the Palladium balance and hair-springs exhibit as close results or better ones than the steel balance and spring. That the non-magnetic balance of Paillard is adjustable to heat and cold we have the most positive proof in our own experience. That its adjustments will remain unimpaired after years of service nobody has, as yet, any reason to doubt. Besides, the steel compensation balances found in the ordinary run of watches are not so constant in their adjustments as Mr. G. would have us believe.

The adjustability of a compensation balance is based upon the difference of expansibility of two metals of which it is composed. That being secured there is no reason except in the quality of the work why it should not remain reasonably constant unless it can be shown that the expansibility of metals varies in time. This, however, we have as yet never seen asserted. In the attempt to cast a doubt on the permanency of the adjustments of the non-magnetic compensation balance, it seems to us Mr. Giles resorts to pleading as a last resort. He is in effect begging the question. But this we cannot grant him, however kindly we feel disposed towards him. The points that we have endeavored to make are: That the so-called "anti-magnetic shield" is a protection against a hypothetical danger only; that the moment a watch in such a shield is exposed to known magnetic influences, as when brought within the magnetic field of even a six-inch magnet, its rate varies and becomes wholly unreliable; that the anti-magnetic shield does not prevent a watch from stopping when brought within the magnetic field of an electro-dynamo, and becoming permanently magnetized and unfit for use.

On the other hand: That the so-called non-magnetic watches, when all the parts of the escapement are made of non-magnetic material, will not stop when brought within the field of any known magnetic influence, nor will they be affected in their rate.

These are the facts by which Mr. Giles' theory of "Magnetism in Watches" has to be tested.

Catching Fish by Electricity.

It was one day of the present week that two men sat in an Auburn insurance office and chatted upon matters about which they are well posted—each on his branch of business. One of the twain was an insurance agent and the other a well-known electrician. Both are Auburn men and deeply interested in Auburn industries.

It is not often that either of them have a moment's time to spare from their daily duties, but on this occasion they fell a-talking and maybe they talked longer than may have been intended.

The talk for a while was on the subject of insurance and insurance companies, and the merits of life and accident insurance, etc. Then suddenly the insurance man broke in upon the subject of electricity. He had been thinking why it wouldn't be quite an idea for the electric light company to run a wire out into Taylor pond or Lake Auburn and give those land-locked salmon a waking up from the electric light station that would so paralyze the hitherto uncatchable fish that he could go to the lake and pick them up by the basketfull; that would be a good deal easier than catching them with a hook and line.

The electricity man by this time was greatly interested, and was very agreeable. "I think," he said, "that an incandescent light of 125 candle-power, if placed in the center of the pond, would light the bottom of Lake Auburn up in pretty good style, and I am sure about the electric shock scheme; it could not fail to work first-rate. It would cost a number of hundred dollars to carry out these ideas, but I think in the end it might be the cheapest for you and I to catch fish, for I myself never had any luck going a-fishing. Some folks'll go out and be gone a few hours, and come back loaded down with them. I never could do it, though, but I've put in considerable time in trying to.

"I speared a trout once over in the Belgrade pond that weighed over five pounds. I tell you, he was a beauty. We fellows were out spearing suckers by the light of a torch, and were in a boat. All of a sudden I saw this trout, like a flash, come toward the boat, and I let fly my spear at him. I think it was mere luck—my getting that trout. I never attributed it to any scientific effort on my part. Did you know there's some awful big fish in these Maine inland waters? I know a man in Belgrade that caught a pickerel over there in one of the ponds that was over five feet long. The biggest fresh-water fish I ever saw—a perfect beauty. When cooked he made a good dinner for a lot of 'em."

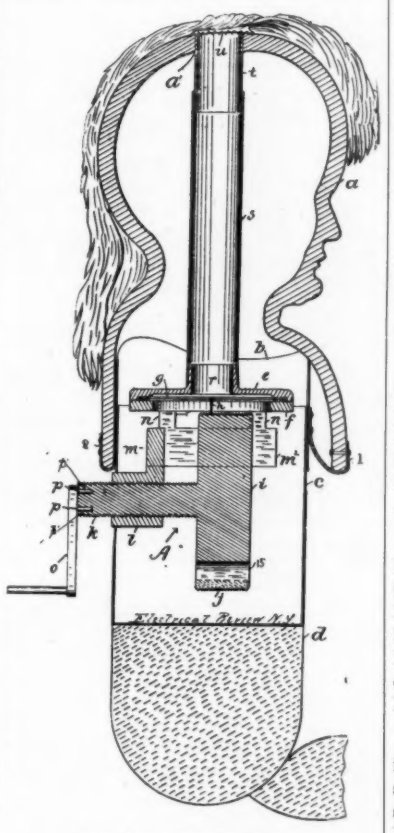
After this story the convention adjourned without action on the subject before discussed.—*Lewiston Journal.*

A Very Good Story of a Living Magnet.

LOUISVILLE, Ky., June 2.—Henry Luegeman, a farmer living near Bennettsville, Ind., while peeling tanbark several years ago, received a shock from lightning. Since that time he has had peculiar electrical and magnetic qualities. Whenever a storm is about to approach Luegeman becomes highly charged. Flies which happen to alight upon him drop to the floor dead, while such things as small particles of iron or steel cling to his fingers. During a recent storm he drew the blade of a case-knife between his forefinger and thumb, which so thoroughly magnetized it that heavy iron articles could easily be raised with it. When placed in a dark room thousands of tiny sparks are emitted from the man's body, and his eyes shine as brightly as if they were incandescent lights. Luegeman claims that he feels no inconvenience from his peculiar gift, but will go near no moving locomotive or heavy iron machinery in a storm for fear of being drawn against it and killed.

A New Phonographic Departure.

The patent to Jacques, of May 22, 1888, for a combined doll and phonograph, discloses a very interesting application of Edison's pioneer invention. It is a child's doll, in which a small phonograph is fixed, and would seem to be quite practicable as a toy.



THE DOLL PHONOGRAPH.

And it would really be something more than the ordinary character of toy, assuming rather the utility of a kindergarten apparatus, as it could be put to so many useful purposes in the way of teaching. It at once suggests a great variety of very useful applications of the phonograph for the benefit and pleasure of the young folks, who would, through its medium, be placed in the command of an automatic story-teller, and have Jack the Giant Killer, and all the other phantasmagoria of childhood, brought to their attention in the most vivid and interesting manner. The cut "speaks for itself."

They Want Telephones.

The county officials at the court house in Omaha, Neb., according to the *Herald*, are making an effort to induce the supervisors to put telephones in their offices, and the attorneys are aiding in the kick. Attorneys, whose offices are some distance from the court house, very frequently have to spend an hour or more in attending to business that should only require five minutes' time if there were telephones at the court house. The officials are also put to a great deal of unnecessary trouble by having very often to run about the city for some little trivial matter that could be settled just as well in three minutes by telephone.

Columbus, Ohio.—The Newark and Granville Electric Street Railway Company. Capital stock, $100,000.

Chicago, Ill.—The American Cable and Electrical Conduit Company has been incorporated. Capital, $500,000. Oliver T. Thomson, and others, incorporators.

Delaware, Ohio.—The Delaware Edison Illuminating Company has been incorporated here with a capital of $50,000. B. W. Brown, and others, incorporators.

Chicago, Ill.—The Inventors' Exchange, of Chicago. Capital, $10,000. To deal in patent articles and to procure patents. Incorporators, G. L. Kennedy, R. L. Hanscom and Wm. Assheton.

Chicago, Ill.—The Mechanical Construction company. Capital stock, $500,000; for the construction of mechanical and chemical apparatus and machinery; incorporators, Joseph A. Faber, Alfred T. Fuller and Edward F. Jackson.

New Orleans, La.—The Consolidated Electric Light and Power Company, capital stock, $150,000, has been chartered, with Henry M. Byllesby, James S. Humbird, Daniel A. Tompkins, of Charlotte, N. C.; Edgar A. Farrar.

Philadelphia.—The incorporators of the Philadelphia Gas Improvement Company reported last week are as follows: William L. Elkins, Jr., George D. Widener, Richard F. Bower and Rufus E. Shapley, of Philadelphia, and Samuel H. Grey, of Camden.

Machias, Me.—The Machias Electric Light Company. Capital stock, $9,900; amount paid in, $990; par value of shares, $100. President, Gilbert Longfellow; treasurer, Henry B. Taylor; directors, C. B. Story, O. M. Vose, Gilbert Longfellow, John K. Ames, Henry R. Taylor, all of Machias.

New York.—The Fort Plain Gas and Electric Light Company filed its articles of incorporation. Capital, $3,000; managers, Edwin W. Wood, William Clark, Andrew Dunn, David E. Dunn and Simeon L. Phillips. Its object is to enlighten, physically, the villages of Fort Plain, Nelliston, Menden, Palatine and Canajoharie.

Portland, Me.—The Maltha Manufacturing Company; capital stock, $100,000; amount paid in, $14,000; par value of shares, $5. William Faxon, Jr., president; Edward P. Payson, treasurer, and William Faxon, Jr., H. P. Talmadge and Stephen M. Allen are directors. The purposes of the corporation are the manufacturing rubber and compounds thereof.

Newark, N. J.—The Edison Phonograph Company, of New Jersey, has been incorporated at Newark by T. A. Edison, A. O. Tate, C. Bachelor and J. C. Tomlinson, with a capital stock of $300,000. It is stated that the factory at Bloomfield is turning out a number of instruments, and unless something unexpected interferes, the first orders will be filled by the first of July.

The owners of the Broadway and Newburg Street Railway, Cleveland, Ohio, are taking steps to operate their line by means of electric motors, and the claim is made that they will have their system in working order before electricity is applied to the East Cleveland roads. The Richmond system, the same as that adopted by the East Cleveland Railroad Company, is favorably regarded by the Broadway and Newburg Company, and it will probably be used by them. Application will be made to the Council for permission to erect poles and string wires for carrying the electric current.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MAY 29, 1888.

383,436 Retouching device; Geo. F. Card, Covington, Ky., assignor to the Geo. F. Card Manufacturing Company, same place.

383,439 Electric alarm clock; Edward J. Colby, Chicago, Ill.

383,444 Galvanometer; Rookes E. B. Crompton and Gisbert Kapp, Chelmsford, County of Essex, England.

383,450 Printing telegraph; Samuel V. Essick, Brooklyn, N. Y.

383,451 Registering and recording weighing scale; Edmund G. Fisher, Minneapolis, Minn.

383,464 Thermo-electric generator; Robert J. Gulcher, Berlin, Germany.

383,484 Manufacture of filaments for electric incandescent lamps; James W. Packard, New York, N. Y.

383,485 Electric punch register; Augustus C. Palmer, Utica, N. Y.

383,495 Test circuit for multiple switchboards; Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place.

383,502 Apparatus for lighting railway cars by electricity; Illius A. Timmis and Stanley C. C. Currie, London, County of Middlesex, England.

383,520 Production, transmission and distribution of electric currents; Charles E. Fritts, New York, N. Y.

383,536 Thermo-electric apparatus for controlling the temperature of water in pipes; Edwin A. Newman, Washington, D. C., assignor to the Newman Anti-Freezing Water Pipe Company, Chicago, Ill.

383,548 Electric battery; Edward A. Widt, Long Island City, N. Y.

383,560 Secondard battery. 383,561 Propelling vehicles by electricity. 383,562 Secondary battery; Camille A. Faure, New York, N. Y., assignor to the Electrical Accumulator Company of New York.

383,563 Telephone call bell system. 383,564 Armature for electric motors. 383,565 Dynamo armature. 383,566 Annunciator. 383,567 Armature for dynamos; Frank E. Fisher, Detroit, Mich.

383,575 Manufacture of secondary batteries; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Electric Car Company of America of Pennsylvania.

383,583 Electro magnetic register; James F. McLaughlin, Philadelphia, Pa.

383,602 Carbon conductor for electric lamps; Hans Joachim von Metzradt, New York, N. Y.

383,605 Apparatus for testing electric circuits; Alden D. Wheeler, Hyde Park, Mass.

383,611 Electric cigar lighter; Reginald Belfield, Pittsburgh, Pa., assignor to the Westinghouse Electric Company, same place.

383,616 Incandescent lamp. 383,617 Armature for dynamos and motors. 383,618 Synchronizing device for alternate current dynamos. 383,619 Armature for dynamos and motors. 383,620, 383,621, 383,622, and 383,623 Combined alternate current and storage system of electrical distribution. Henry M. Byllesby, Pittsburgh, Pa., assignor to the Westinghouse Electric Company, same place.

383,640 Storage battery plate; Charles D. B. Gibson, New York, N. Y.

383,647 Switch for adjustable resistances. 383,648 Apparatus for connecting alternate current dynamos. 383,649 Voltmeter. Philip Lange, Pittsburgh, Pa., assignor to the Westinghouse Electric Company, same place.

383,651 Governor for electric motors; Richard H. Mather, Windsor, Ct.

383,655 Circuit closing device for electric clocks; Chester H. Bond, Brooklyn, N. Y.

383,657 Bobbin for the field magnets of dynamos. 383,658 Brush holder for electric generators. 383,659 Armature for dynamos. Albert Schmid, Allegheny, assignor to the Westinghouse Electric Company, Pittsburgh, Pa.

383,661 Circuit controlling apparatus for electric lighting circuits. 383,662 Coupling of alternate electric current generators. 383,663 Armature for dynamos. 383,664 Armature for electric machines. 383,665 Indicator for electric circuits. 383,666 Apparatus for detecting ground connections in electric circuits. 383,667 Method of indicating electric currents. 383,668 Electrical indicator for alternating electric currents. 383,669, 383,670, and 383,671 Electrical indicator. 383,672 Method of indicating electric currents. Oliver B. Shallenberger, Rochester, assignor to the Westinghouse Electric Company, Pittsburgh, Pa.

383,675 Manufacture of incandescent electric lamps; Edward P. Thompson, Elizabeth, N. J.

383,676 Evacuating electric lamps.

383,677 Galvanic battery fluid; Hans J. von Metzradt, New York, N. Y.

383,678 Electric meter; George Westinghouse, Jr., Pittsburgh, Pa.

383,679 Mounting armatures of dynamos; George Westinghouse, Jr., Pittsburgh, Pa., assignor to the Westinghouse Electric Company, same place.

383,680 Electric meter; George Westinghouse, Jr., and Philip Lange, Pittsburgh, Pa., assignors to the Westinghouse Electric Company, same place.

383,706 Galvanic battery; Harry B. Cox, Cincinnati, Ohio, assignor to George Clarke Cox, same place.

383,725 Electric needle aununciator; William E. Gilland, Rudolph Segerdahl, Chicago, Ill., assignors to John F. Wollensack, same place.

383,734 Insulator for electrical wires; Frank E. Keyes, Peterborough, N. H.

383,756 Crawler for electric or other conduits.

383,757 Method of filling secondary battery plates; Henry G. Morris and Pedro G. Salom, Philadelphia, Pa.

383,770 Underground conduit and grip for electric railways; Elias E. Ries and Albert H. Henderson, Baltimore, Md.

383,786 Electric apparatus for winding clocks; Mariano Viau, Bilbao, Spain.

383,794 Electric smelling bottle; Charles T. Brown, Chicago, Ill., assignor to Flora L. Brown, same place.

383,795 Device for preventing incrustation in steam boilers; William B. Bull, Quincy, Ill.

383,832 Current collector for electric machines; William Stanley, Jr., Great Barrington, Mass.

383,843 Relay; John E. Watson, Louisville, Ky., assignor to the International Electric Company, same place.

383,844 Overhead conducting system for electric railways; Granville T. Woods, Cincinnati, Ohio, assignor to the Woods Electric Company, same place.

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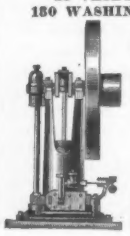

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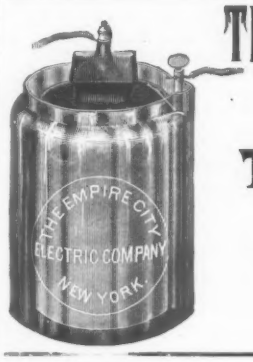

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